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Past and Present

THE speeches delivered by politicians and some others on the subject of electricity supply policy must make some of the early pioneers in this branch of the industry turn over in their graves, if circumstances permit them to perform that interesting operation.

Of what service is it to anybody, or of what value as an argument, for an orator at St. Stephen's to inform members of the House of Commons in this year of grace 1936 that "it was a pity that electricity was not nationalised in this country at the outset"?

With thoughts in mind of the Chamberlain Act of 1882 and all that followed between that year and 1888; with knowledge of all that inventors, engineers, financiers, organisers and others put into the industry long before there was any thought of action on the part of municipal authorities; and with a personal intimacy with the sacrifices and efforts that have been made by private interests to give this country a "cheap and abundant" supply of electricity we are tempted to indulge in the strongest possible condemnation of those who speak of electricity policy without taking the trouble to learn the real history of the subject in the first place.

Who, remembering the facts of those early days, would have dreamt of nationalising electricity supply "at the outset"? What is meant by "at the outset"? Was it not that period when private individuals were inventing and planning to make electricity available to the public; when they were exercising their ingenuity and sinking their capital with loss after loss as their only reward? What utter nonsense to suggest that under such conditions electricity supply should have been nationalised!

Again, wise thirty or forty years after the event, our advisers tell us that instead of coal being brought from the collieries to London for electrical generation it would "be far better to generate the current in the coal areas and distribute it to the consumer by means of high-tension mains." Before such original (*sic*) propositions are dangled before legislators, a study of the volumes of the ELECTRICAL REVIEW containing a series of articles by the late B. H. Thwaite, contributions by the late W. H. Booth, and many other authorities, on generation at the pit's mouth, and even down below, would form a profitable form of recreation.

Without holding a brief for anybody to-day, we cannot help recalling to readers' minds the enterprise displayed by private limited liability companies in London between forty and fifty years ago; also the classic case of Ferranti's great pioneering piece of high-tension work at Deptford, to support which Lord Wantage poured out his private wealth like water.

It would have sounded strange indeed in those days if anybody had seriously urged a "nationalisation" policy. "At the outset," forsooth! Would the name of Ferranti or the meaning of Deptford have been what they are to us to-day under a national electrical policy born about the year 1890?

Yet again, when the big power companies were embarking, amidst great opposition, upon schemes to provide a cheap and plentiful supply of power for industry in areas in which local authorities could not possess rights to meet the needs that might arise—what chance did a nationalisation policy stand?

Whatever policy may seem to be desirable to-day—after what has been proceeding throughout the country since we began to bring order out of a chaos that followed the pursuance of conflicting ambitions; whether a form of State ownership or control will give better service than private ownership—these are matters for intelligent discussion between men with well-informed minds.

But if we are going to have debates, either in or out of Parliament, do let us refrain from indulging in reflections upon what we think ought to have been done long years ago, when we know full well that they could not have been done, and when we are completely ignorant concerning whether they would not have landed us in a worse plight if that had been possible.

The Commons Debate

THE motion before the House last week favoured the setting up of a national authority effectively to carry out a policy of national ownership and control for generation, distribution and management purposes, subject to Ministerial and other direction provided by statute. The seconder said that the McGowan Report saw public ownership as ultimately the only solution, but the House disposed of the motion by accepting by a majority of 173 votes to 114 an amendment which expressed the hope that the Government would introduce a Bill based on the McGowan Report as soon as Parliamentary time permitted. One speaker deprecated any attempt to approach the subject under the influence of political prejudice, another submitted that, while there was room for reform, no case for nationalisation had been made out, and indicated, as we have fully done in these pages, how the existence of many municipal gas undertakings affects our problem. Another member regarded the success of the supply industry as a compliment to Socialisation, because so many undertakings were municipally owned, and being always a whole-hogger he plumped for a policy of "scrap the lot"—the McGowan Report, the whole of the existing undertakings (!), the Central Electricity Board and the Commissioners. Then he would form a National Corporation, a business concern with regional boards with a first-class electrical engineer and a first-class sales manager in each region.

Two Plans

AND so the discussion continued until the Minister of Transport reviewed the situation as it had developed since 1926 and asked in effect what benefit all these revolutionary proposals were going to bring to anybody. He appealed to hearers not to commit themselves to a hide-bound solution of the electricity problem before they had studied the plan of the Government. So the Government has a plan! It might be desirable that it should not take too long to make it known. Undertakings are interested to hear what it is—more interested than are the politicians. But we need not remain idle while we await the Government plan, for P.E.P., that more or less mysterious body which has already set forth its ideas in the rough, shall we say, has produced for publication to-day a bulky report elaborating its plan at greater length. This we outline on page 786. In brief its proposals are that legislation shall be introduced to appoint a Committee of Investigation; create an Electrical Development Authority; increase the powers of the Electricity Commission; co-ordinate and simplify existing legislation; and remove restrictions and anomalies.

Decisive Coal Costs

IN his lecture on "The Economics of Electric Power Generation" which he delivered before the London Technical Group of the E.P.E.A., Mr. W. N. C. Clinch emphasised the importance of low fuel cost, since it formed about 70 per cent. of the works cost. This may be confirmed from another angle, that of load development. The amount paid for coal is the only one that increases substantially with the number of kWh generated. Other operating charges remain relatively steady whatever the output; so do capital charges. These standing charges can be reduced for each kWh by increasing the output for the same demand, but the output will not be increased to give this result if the coal cost is high.

The Crompton Parkinson Report

REMARKABLE progress during the past year is reported by Crompton Parkinson, Ltd. The net profit increased by over 45 per cent., enabling the ordinary dividends to be maintained at 12½ per cent. for the year on an enlarged capital. In addition, the holders of the two classes of ordinary shares are again to receive a handsome share bonus. The very satisfactory results are ascribed, in part, to the larger sales, but more particularly to enhanced efficiency in production. In view of all that has been said recently regarding the necessity of fostering export trade, it is satisfactory to learn that the company is paying considerable attention to the overseas markets, especially those of the Dominions. The cable business has shown expansion and the British Electric Transformer Co. has had a good year. An entirely new lamp works is being erected. While the litigation in the matter of lamp patents remains in the same state, the company expresses hopefulness as to the result. The company's employés are sharing in the prosperity by way of extended benefits from the superannuation and benevolent funds; the retiring age has been reduced from 65 to 60.

Battersea to be Extended

THE remarkable operating results being achieved at Battersea power-station provide enough justification for the proposal to extend it in time to meet the load anticipated by the Central Electricity Board in devising its generating plant programme for the winter of 1940-41. The London Power Co.'s application to the Electricity Commissioners for consent to install another 100,000-kW turbo-alternator reflects the confidence of Sir Leonard Pearce in the reliability as well as in the thermal efficiency of the biggest units that results from his experience with the existing machine of the same capacity. The extension will entail civil engineering work, as it initiates the second half of the station, in which space is to be provided for further sets. Steam conditions will not necessarily be the same as those in the present wing, where the tendency is already evident towards raising the superheat temperature to the highest practicable point.

Cable Sheaths

As about 64,000 tons of lead are used annually in Great Britain alone for sheathing cables, any saving of metal (as well as of labour), such as that indicated as possible by Dr. P. Dunsheath in his I.E.E. paper, should appreciably affect manufacturing costs. More important, however, are the claims for an improved product due to substituting continuous extrusion for the intermittent process employing a slowly reciprocating press. A lead or lead-alloy covering usually has as its main duty the protection of that invaluable, but unfortunately very hygroscopic, dielectric paper from moisture. A large proportion of breakdowns in the past has been due to difficulties in securing an entirely homogeneous sheathing, but hitherto improvements in this kind of mechanical protection have not kept abreast of the more purely electrical developments in cable manufacture, which have been rapid in recent years.

The Vehicle

WHILE good lighting indoors is necessary for the preservation of eyesight, it is of even greater moment in the streets, where the penalty for illumination deficiencies may be so much greater and more sudden. Speaking at Birmingham, the President of the Institution of Electrical Engineers referred to the risks run by the 75 to 80 per cent. of the population suffering from defective vision and commended the decision of that city to light 150 miles of streets with 4,000 electric lamps as making for road safety. There remains much to be done, however, which calls for a close understanding between electrical men and those who, though not concerned with electricity as such, are nevertheless interested in securing adequate street lighting, just as there is with regard to the many other applications of electricity. In our specialised field we provide methods of distribution, but distribution, as Mr. H. T. Young said, is only a vehicle. What counts is the extent to which the public and its advisers consider that electricity meets its needs.

A Variety of Coal Derivatives

An up-to-date Scottish coke-oven plant

COKE, gas and such by-products of coal as tar, sulphate of ammonia, benzole and motor spirit are produced at the new coke-oven and by-product installation at the Govan Ironworks, Glasgow, of William Dixon, Ltd. The coke-ovens are believed to be the first of this type to be installed in Scotland, and complete handling of the coal from, and the coke to, railway wagons is provided for.

Messrs. Dixon have their own generating station, but by means of a duplicate bus-bar switchboard supplied by the Metropolitan-Vickers Electrical Co., Ltd., the 3-kV supply from this source is supplemented by a similar supply from the Glasgow undertaking. The change-over circuit-breakers on this board can be connected to either set of bus-bars at will, and in this way the two supplies are normally maintained simultaneously

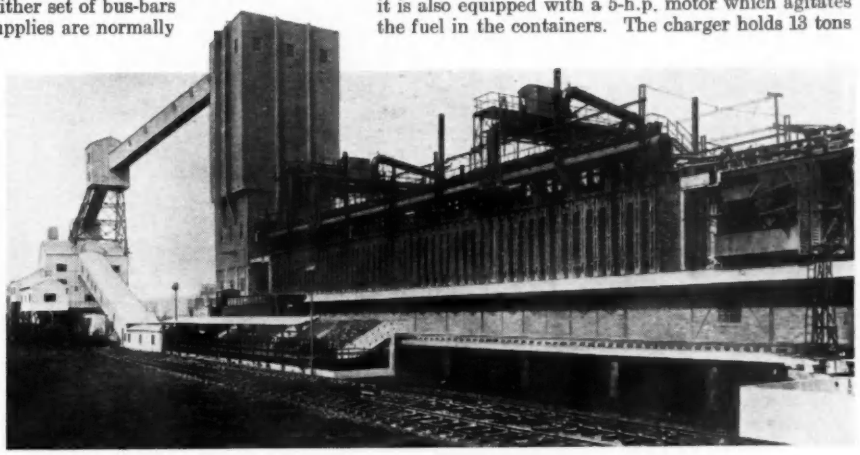
Some of the larger motors throughout the installation are run directly at the supply pressure, but for most of them a transformer in the main sub-station provides a 440-V three-phase supply and there is a 110-V supply for lighting. A simple 440-V main distribution board consists of air-break switch-fuse units built up with a central bus-bar chamber on an angle-iron frame, a method of construction adopted for several sub and local distribution boards about the works. This sub-station takes up the ground floor of a 2,000-ton bunker for direct service to the ovens, but before reaching this the coal is crushed.

Raw coal is delivered to an underground hopper, the railway wagons being tipped by one or two 25-h.p. motor-driven winches situated in an overhead concrete structure. These motors are started from a distance by contactor control gear by means of push-button switches from the ground level, and stopped by limit switches operated by an arm which moves to and fro along a worm driven from the winding-drum shaft. A simple solenoid brake serves each equipment.

Inclined belt conveyors raise the raw coal from the underground hopper and deliver it to one of two crushers, each belt driven by a 120-h.p. 3,000-V motor with contactor and oil circuit-breaker control. At different angles two belt conveyors, 260 ft. and 125 ft. long respectively, deliver the crushed coal to a final height of about 150 ft. at the top of the service bunker. To ensure even distribution of the coal into this hopper it is fed from the elevating conveyors *via* a shuttle belt—a short endless-belt conveyor system which operates normally while it is being revolved as a whole with the carriage on which it is built One 7.5-h.p. motor serves for both operations at the same time *via* gear drives, but the carriage drive can be utilised or not at will by means of a simple clutch.

The motors of the conveyor system feeding the service bunker are all automatically operated in the correct sequence. Normally the 15-h.p. motor driving the final belt is first started by a push-button switch at ground level, and each subsequent motor is put into operation by a time-delay contactor on the starter of the previous motor. Water tanks of 50,000 gal. capacity surmount the service bunker structure. The coal-handling plant as a whole up to the service bunker has a capacity of about 120 tons per hour.

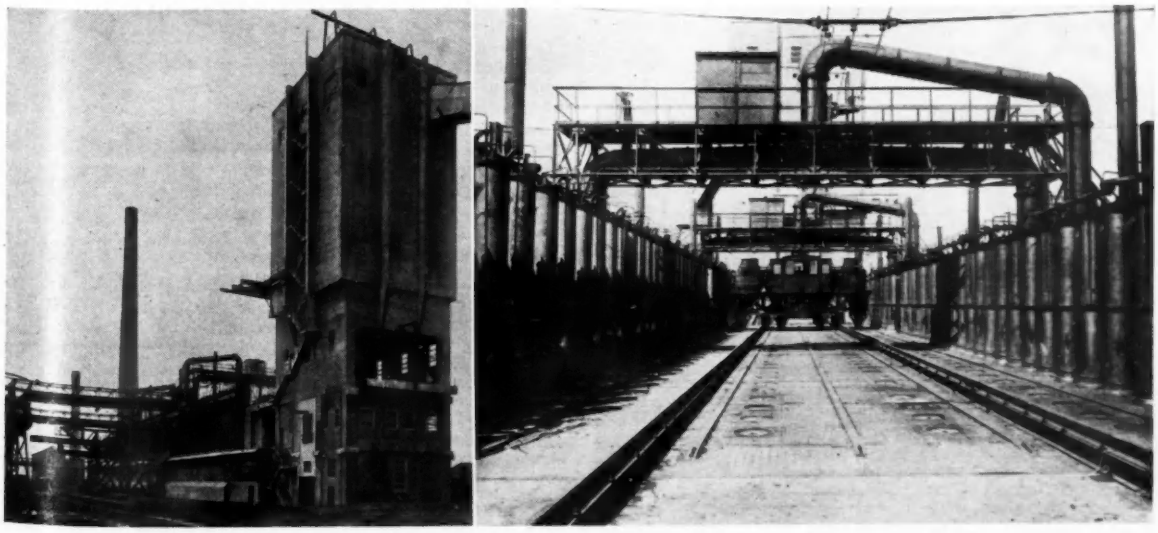
The service bunker is so situated at one end of a battery of fifty coke ovens that the travelling oven charger which runs on rails on the roof of the ovens is gravity fed with coal when under the bunker. The charger is propelled by a 30-h.p. motor with a traction-type controller and contactor gear, and it is also equipped with a 5-h.p. motor which agitates the fuel in the containers. The charger holds 13 tons of coal, the capacity of each oven, and it receives its electricity supply *via* an overhead conductor system and a trolley arm.



Oven battery and coal-handling system at the Govan Ironworks

It is necessary to level the top of the coal immediately after it has been fed into an oven, and this operation, and also removing the heavy clamp-on oven door and slewing it to one side, as well as pushing the coke through the oven to be discharged from the other side of the oven after its 18 hours' baking, are all catered for by a Wellman pusher. The latter is equipped with a 50-h.p. motor by which it is propelled along one side of the complete battery, a 50-h.p. motor which drives the ram *via* heavy gear wheels and a rack on the ram arm, a 30-h.p. motor which serves the levelling arm, and also a 5-h.p. motor by which the door-extraction equipment is operated. The three larger motors are all controlled by traction-type equipment from the driver's cabin, while the controller of the small motor is on the platform on a level with the oven-battery platform, just below the bottoms of the doors. A sliding pick-up from bare conductors along the battery wall provides for the electricity supply to the pusher.

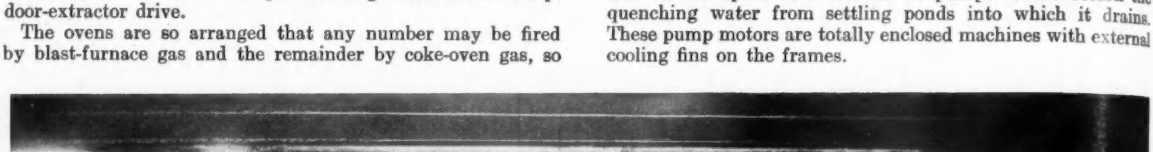
Similar electricity feed and propelling arrangements are provided for a coke guide on the other side of the ovens. This affords the necessary communication for the coke between the oven exit and the locomotive-drawn lorry 10 ft. or so from



Left: Coal service bunker and oven battery showing the pusher. Right: Coke oven charger operating above the ovens

the oven, and it has a 10-h.p. travelling motor and a 5-h.p. door-extractor drive.

The ovens are so arranged that any number may be fired by blast-furnace gas and the remainder by coke-oven gas, so



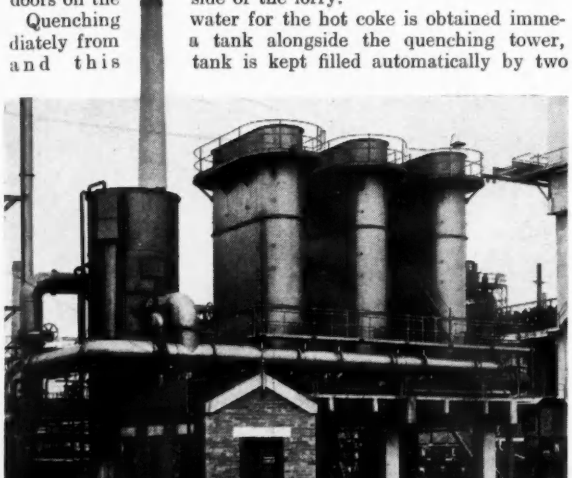
Exhauster and pump house

that rich oven gas is available for outside purposes within very wide limits. The plant is designed for rapidly effecting changes of the heating gas to comply with varying demands. Longitudinal heat regenerators—one to each oven—provide the means of abstracting heat from the combustion gases and imparting it to the ingoing air and lean gas, and a very effective system of obtaining the necessary reversals of the flow of gas and air is governed by an automatic reversing winch at one end of the oven battery "cellar."

This winch is time controlled to reverse the flows every half-hour, when it opens and closes automatically in the correct sequence all the governing inlet and outlet valves controlling the direction flow. All these half-hourly operations are carried out in two minutes. The winch has just a single and self-contained motor drive with Igranic contactor control. At each directional-flow change-over it winds up a separate clock by means of which an alarm is given if the winch fails to operate or to stop in the correct position. Red and green lamps indicate the direction of flow of the gases at any time.

The locomotive and its lorry run parallel with the ovens and the coke guide and their duties are first to transport the coke to a quenching tower where it is sprayed with water and then to return it and discharge it on to a sloping coke wharf alongside the track. An 80-h.p. motor with a heavy traction-type controller provides the necessary propelling power for the locomotive, which is also equipped with a small motor-driven compressor for operating the coke-discharging doors on the side of the lorry.

Quenching water for the hot coke is obtained immediately from a tank alongside the quenching tower, and this tank is kept filled automatically by two float-switch operated motor-driven pumps which return the quenching water from settling ponds into which it drains. These pump motors are totally enclosed machines with external cooling fins on the frames.



Electrostatic plant and scrubbers

The quenched coke from the coke wharf is fed to the main belt conveyor leading to the primary screen house where the furnace coke is separated from the smaller sizes by a grizzley screen and is taken across the house by a second conveyor and delivered to a boom conveyor which loads it into wagons. The small coke passed through the screen is taken by another conveyor to the secondary screen house where it is separated into three domestic sizes and breeze by a vibrating screen and is then delivered to four concrete storage bins whence it is discharged into wagons as required.

Gas and air reversing valves for the coke ovens

The motors on the coke conveyor system are automatically controlled to start up in the correct sequence as in the case of the coal-handling plant, while a point of special interest is the centralised control of four conveyor motors (up to 20 h.p.) from one large metal-cased starting cubicle. The vibrating screen is driven by a 5-h.p. motor through V belts and an eccentric.

For feeding the tanks above the service bunkers and the recovery plant generally there are two 120-h.p. 3,000-V horizontal shaft motor-pump sets supplied by Mather & Platt, Ltd., each having a capacity of 1,500 gallons per minute. The motors are enclosed-ventilated units and are switched direct on to the line by oil circuit-breakers with overload protection.

Gases from the ovens pass to vertical-tube condensers in which the bulk of the tar and some ammonia liquor is condensed and drained into a tar catch and circulating tank from which the hot liquor is circulated *via* sprays in the ascension pipe valves for flushing purposes. The overflow from the tar catch is separated and the two liquids are stored.

The cooled gas from the condensers passes to an electric precipitation plant for the removal of the suspended tar.

This plant is served entirely by static high-voltage equipment. Transformers and metal-oxide rectifiers convert the 440-V a.c. supply to 40,000 V continuous for application to the electrodes housed in the tubes.

Clean gas from the tar precipitator passes through steam-turbine driven exhausters to saturators for the preparation of sulphate of ammonia. The sulphate is ejected from the saturators into draining tables inside the sulphate house and then into centrifuges for the removal of the moisture. An indication of the heavy starting torque of these centrifugal driers is the rating of the directly coupled vertical motors (3-14 h.p., 735 r.p.m.) by Lancashire Dynamo and Crypto, Ltd.

The sulphate from the centrifuges is belt fed to a horizontal-cylinder drier fitted with internal paddle mixers, and from the drier it is elevated to a hopper serving bag fillers. One motor serves the drier, elevator and conveyor, and there is a portable sack elevator, with self-contained motor drive and plug connector.

On its way from the saturators to the benzole scrubbers the gas is treated in two direct spray gas coolers, in the second of which is an oil-scrubbing section for the removal of naphthalene. In the exhauster house are batteries of motor-driven pumps for circulating the scrubbing media. The motors, mostly 11-h.p., are totally enclosed equipments with external cooling fins on the frames, and they are controlled by flame-proof starting gear. Rich oil from the benzole scrubbers is dealt with in the first section of the benzole plant from which is obtained once-run crude benzole. In the second section of the plant is a still for converting crude benzole into once-run benzole, while in the third section the once-run benzole is rectified into motor spirit and other fractions.

Except where the make has already been indicated, practically all the motors were supplied by the English Electric Co., Ltd., nearly all the motor starting gear on the travelling equipments (the Wellman pusher, for instance) by the Igranic Electric Co., Ltd., and practically all the "stationary" motor-starting apparatus by Allen West & Co., Ltd. Simon-Carves, Ltd., were responsible for the contract, and W. J. Furse & Co., Ltd., for the electrical installation work.

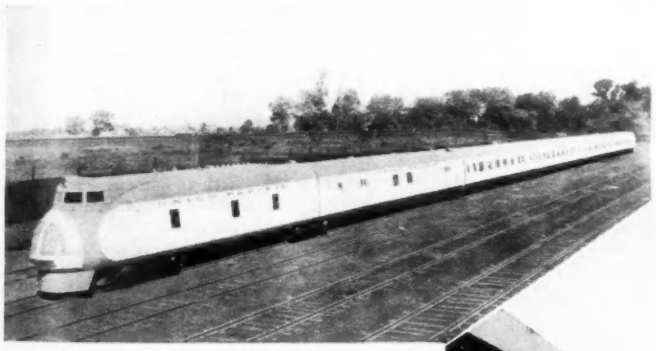
We are indebted to William Dixon, Ltd., for permission to view the new plant and to Mr. Thomas Ritchie, the works manager, for his help in the collection of information.

Streamlined Diesel-electric Trains.

Experience in the United States proves their economy

By J. W. Brauns

MORE than three-quarters of the thousand or so Diesel-driven trains in operation on the United States railways incorporate an electric drive for changing the inherently constant torque of the engine to the variable torque required by the wheels. During the past five years the weight of the Diesel engine has been reduced from 70 to 20 lb. per h.p. and its thermal efficiency is now from 30 to 35 per cent.



A Union-Pacific six-car streamlined and air-conditioned train, and, right, two three-car streamlined Diesel-electric trains at Kansas City Station where they meet in regular service

Tests made three years ago showed that for propelling a conventional one-ton train at 60 m.p.h., some 300 h.p. is required, but with streamlining only 200 h.p. is needed. At 100 m.p.h. the 1,150 h.p. hitherto needed can be reduced to 670 h.p.

In 1934, the Union Pacific Railroad Co. put into service an articulated 116-passenger streamlined train (three cars on only four tracks), with a body of aluminium alloy, driven by a 600-h.p., 1,200-r.p.m. engine geared for a maximum speed of 117 m.p.h. This train is now running 374 miles daily at a scheduled speed of 53.4 m.p.h.

The Burlington "Zephyr," which was completed at about the same time, is of similar construction but built of stainless steel. It weighs 110 tons, has a maximum speed of 117 m.p.h. and seats 112 passengers, recently increased from 72. Its non-stop run from Denver to Chicago, 1,015 miles in 13 hr. 5 min. at an average speed of 77.5 m.p.h., is said to be the best performance yet achieved for long-distance railway operation. The 418 gal. of fuel cost not much more than one-quarter of that required by a conventional steam train of equal seating capacity. This engine is now making a daily round trip of 502 miles and its costs of operation are about half those of a steam train. Three other trains of the same type have now been put into service.

Two six-car units pulled by 1,800-h.p. locomotives (two 900-h.p., 750-r.p.m. engines) have been ordered by the Burlington Co. for the Chicago-Twin Cities (Minneapolis and St. Paul, Minnesota) route, and two of ten cars for the Chicago-Denver route. The latter will work to a schedule of sixteen hours for the 1,039 miles, which will be 11 hr. 45 min. faster than the present west-bound steam service and 9 hr. 15 min. faster than the east-bound service. Each train will hold 200 passengers and will have an exterior width of 10 ft. The trains will be propelled by 3,000-h.p. locomotives in two vehicle units, one equipped with a 1,200-h.p., 750-r.p.m. engine and the other by two 900-h.p., 750-r.p.m. engines.

The Union Pacific now has in operation a second streamlined train with a 1,200-h.p., 750-r.p.m. Diesel engine and with seven Pullman cars. Travelling from Los Angeles to New York in 56 hr. 55 min., it easily beat the transcontinental record of 71 hr. 27 min. for 3,258 miles at an average speed of 57.2 m.p.h., reaching a maximum of 120 m.p.h. The trains weighs 265 tons light and 295 tons loaded, and carries 157 passengers.

Four more ten-car Pullman trains with two power units are on order for the same company. These will give a through service from Chicago to Los Angeles, San Francisco, Portland and Denver, the journey to Los Angeles taking two nights and one day instead of three nights and two days. More than twenty high-speed streamlined trains are on order or in service, including two for the Boston and Maine and Illinois Central and Seaboard Airline railways. The latter, like those previously mentioned, have General Electric equipment with Winton engines and Budd or Pullman bodies. Two others with Westinghouse electrical equipment, Westinghouse and McIntosh and Seymour engines and Goodyear-Zeppelin and A.C. & F. bodies have been supplied for the New York, New Haven and Hartford, and the Gulf, Mobile and Northern railways.

In order to make use of existing rolling stock, the Santa Fé Co. has just put into commission a 3,600-h.p. Diesel-electric locomotive to pull a standard transcontinental train, and the Baltimore and Ohio and the Electromotive Corporation of Chicago have acted similarly, greatly reducing running times. Experience in the United States is that the Diesel-electric system is practicable on both long and short haul passenger and goods trains, and that its economy with streamlined trains and as a substitute for the steam locomotive handling the conventional train have been amply demonstrated.

Thermal Stresses in Current Transformers.

By H. Hurworth

NO business which expands as quickly as electricity supply does can be immune from the penalties of rapid depreciation and the early replacement of equipment which is rendered obsolete by unexpected difficulties. The rapid development of distribution systems, with the adoption of higher transmission and distribution voltages and the frequent interlinking of systems, has imposed stresses which the older equipment was not designed to withstand.

Attention has been directed for some years to the effect which these stresses impose on circuit-breakers and current transformers, but it is only recently that distribution engineers have begun to appreciate the magnitude of the stresses and their effect on current transformers.

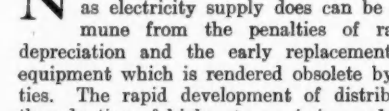


Fig. 1.—Curve showing the rate of increase in thermal stress with increase in fault current

Improvements in methods of protection with the object of reducing fault-clearance times have helped to reduce these stresses, but increasing fault conditions have partly neutralised this effect by the necessity for employing longer time settings on time-graded systems to ensure reliable discrimination.

Relation to Fault-current Value

Since the thermal stress is proportionate to the square of the fault-current value, an increase in the maximum available fault current from 30,000 kVA to 100,000 kVA (fig. 1) increases the thermal stress to eleven times its previous value, consequently many current transformers which were once perfectly satisfactory are now a potential source of danger.

The rate of temperature rise in a current transformer during fault conditions is proportionate to the amount of energy absorbed by the winding in the form of heat, less the amount of heat energy lost by radiation or conduction. The rate of heat loss depends on so many variable factors that it is impracticable to estimate its value with any degree of accuracy, but as the total loss is extremely small compared with the heat absorbed, it can be ignored without seriously upsetting the calculations.

The power dissipated and absorbed by the winding in the form of heat energy is proportionate to the square of the fault current, and to resistance of the winding.

Assuming these were to remain at a constant value during the existence of the fault conditions the temperature of the winding would increase at a constant rate which could be expressed in degrees per second (fig. 2). In practice, the resistance of the winding varies with the temperature, the amount of this variation being expressed as the temperature co-efficient. The accuracy of values given in temperature tables is usually limited to temperatures between zero and 100 deg. C., but practical tests demonstrate that it is approximately correct up to melting temperature (fig. 3).

As power dissipation increases proportionately to the increase in resistance, the time-temperature curve does not follow a straight line law but becomes steeper as the temperature rises towards melting point. Fig 4 shows the time-temperature curve, the slope of which at any instant is obtained by combining values obtained from figs 2 and 3, while the temperature at any instant can be calculated simply with the aid of the following formula:—

$$\log_{10}(A+234.5/a+234.5) = 1.97D^2 T \times 10^{-11},$$

where A = final temperature in deg. C., a = initial temperature in deg. C., D = current density in A per sq. in., and T = time in seconds.

Effect of the rate of temperature rise

The temperature rises comparatively slowly during the early stages of the fault, but as the resistance increases, the rate of rise is accelerated with increasing rapidity. This effect reduces the margin between safe working and complete explosion. Examination of fig. 4 shows that if a c.t. were subjected to a fault current which raised the temperature of the winding to 250 deg. C. in 0.15 sec., a further 0.165 sec. would suffice to raise the temperature to melting point. Actually the margin between danger and safety is less than this, due to a reduction in the mechanical strength of the windings as the temperature rises; consequently magnetic stresses would probably cause the winding to rupture an appreciable time before melting temperature was reached.

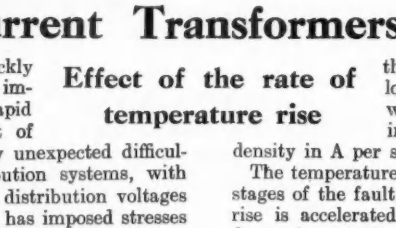


Fig. 2.—Temperature rise in the primary winding of a 40/5 current transformer, assuming a constant energy dissipation of 17.9 kW per ft. of winding. (Corresponding to 10,000 A fault current and assuming that the resistance remains constant at a value corresponding to 0 deg. C.) Rate of temperature rise = 557 deg. C. per sec.

Skin Effect

Some consideration must also be given to the skin effect caused by very heavy currents. This increases the effective resistance of the conductor, and by increasing the amount of power dissipated lowers the factor of safety. It is partly offset by the retention of a stalk of metal in the centre of the conductor which remains comparatively cool, and consequently retains sufficient mechanical strength to delay the bursting of the winding by magnetic forces.

It is difficult to estimate whether the increase in mechanical strength is sufficient to counterbalance the increase in stress, but in the absence of actual confirmation it is desirable to increase the factor of safety where equipment is subjected to very large fault currents.

Stresses in the secondary windings of current transformers can be ignored, because the secondary current is usually limited by core saturation to 200 or 300 A; consequently, an easy method of averting danger arising from thermal stresses is to use current transformers having bar primaries with a substantial cross-sectional area. Unfortunately, where low ratios are required these are often unsuitable owing to their limited output, and unless a high permeability alloy is used for the core several primary turns may be essential to provide the ampere turns necessary for class C accuracy with even a 5-VA burden.

If circumstances demand a high standard of accuracy combined with a low ratio and a high thermal rating, it may be necessary to use a wound primary and a nickel alloy core to reduce the overall size of the c.t. sufficiently to accommodate it in a standard c.t. chamber. This will obviously increase its cost, but since the only satisfactory alternative is to construct a special chamber, it must be left to the designer to choose the more economical arrangement.

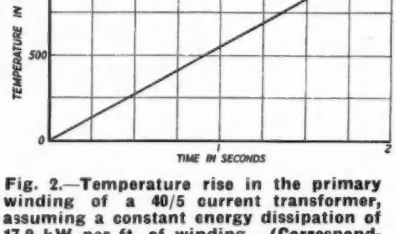


Fig. 3.—Curve showing the relationship between the resistance and temperature of a copper conductor

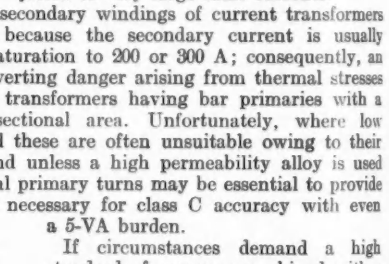


Fig. 4.—Curve showing the rate of temperature rise of a copper conductor under fault conditions

As it is often difficult to provide c.t. accommodation, it is doubly wasteful to specify c.t.'s which have greater accuracy than that required for their duty; for instance, class C 15-VA

c.t.'s are sometimes specified for ammeter service, whereas class D accuracy would probably meet all requirements, and at the same time reduce the danger of overstressing under fault conditions, and also simplify the design of the switchgear.

The Rating of Existing Transformers

One of the problems which must receive serious consideration by distribution engineers is the possibility of modern fault conditions introducing an element of danger due to the type of current transformers installed a few years ago. Unfortunately the difficulties of estimating their standard of safety are frequently increased by the total lack of any technical data which would be of assistance in determining the short-time rating.

Where the cross sectional area, or even the length and number of turns in the primary winding is known, a value can be found for the thermal rating which is sufficiently accurate for the purpose, and if considerable numbers of current transformers of a standard type are in use, this information is obtainable from the manufacturers. Usually this method is not practicable, due to the large number of ratios, and the diverse types of switchgear installed at different periods of development; consequently if a safe alternative method of determining the rating can be found, it is preferable to employ this, even at the expense of replacing a few transformers which would prove to be safe if full technical information were available.

Thermal over-current rating is usually assessed in terms of the normal full load current and investigation has shown that the smallest winding which will carry the normal full-load current continuously, is also capable of sustaining a fault current equal to 100 times the normal rating for a period of 0.3 sec., without serious damage to the insulation. This can be used to define the rating of current transformers which are difficult to disconnect for examination or testing. Once these values are established, it is simple to calculate the length of time any c.t. will sustain a specified fault current.

If radiation losses are ignored, the time is inversely proportional to the square of the fault current value, and may be expressed by the following formula :—

Time in seconds = $(k \times \text{normal primary rating})^2 / \text{fault current}^2 \times K_T$, where K_T is the length of time in seconds which the c.t. will withstand a current of k, times the normal primary rating. For example, assuming it is required to find the length of time a 200/5 current transformer will safely withstand a fault of 100,000 kVA at 6,600 V, three-phase : k=100, K_T=0.3 sec., r.m.s. fault current=8,900 A, time in seconds= $(100 \times 200)^2 / 8{,}900^2 \times 0.3 = 1.52$ sec.

An advantage of this method is that the margin for error is obviously on the side of safety. In addition the tendency amongst manufacturers has been to reduce the normal working current density in current-transformer windings and it is usual to find that the rating of modern examples has increased from 0.3 to 0.5 sec.

Primary Winding Resistance

An alternative method which has been suggested, is to measure the resistance of the primary winding on the assumption that current transformers of similar type and classification have approximately the same length of primary winding. In other words, if the number of turns is reduced, the size of the core is proportionately increased causing a corresponding increase in the length per turn. This method is essentially one of comparison between different current transformers; therefore, detailed knowledge of one transformer as a basis for comparison is requisite.

Since the length of the unknown primary winding is assumed to be the same as that of the standard transformer any increase in the primary resistance indicates a proportionate decrease in the cross sectional area of the conductor, and consequently the thermal rating. The performance of two current transformers of different types such as a porcelain insulated one and the more common tape insulated type cannot be compared, because the average length of turn is much greater on the former, owing to its special design, and therefore with similar conductor sizes, the primary resistance may be four or five times as great.

Another disadvantage of applying this method of comparison to old transformers is due to the possibility of a joint existing inside between the tail and the actual winding. Such a joint may have a higher resistance than a similar length of the actual winding, with the result that local heating takes place; consequently the thermal rating of the joint is lower than the average for the whole winding. Experience has proved that the existence of such a joint can cause a burn-out under fault condition which should have been withstood successfully.

Whatever method is employed, some consideration should be given to the frequency with which the c.t. may have to withstand fault conditions, the reliability of the associated switchgear, and also the type of fault which is most likely to occur on the system under consideration. The first item will be dependent on the reliability of the system, as any transformer, which is frequently subjected to heavy current surges, must be capable of withstanding these without the slightest damage, whereas if the service conditions indicate that only one or two faults are likely to be sustained during its lifetime, it could be safely retained in service even if the estimated fault conditions were sufficiently severe to introduce the possibility of slightly charred inter-turn insulation.

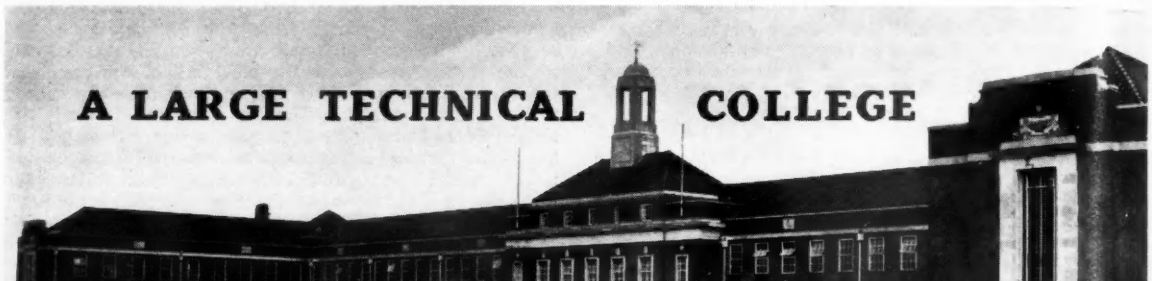
If the associated switchgear possesses 100 per cent. operating reliability, the windings need sustain the maximum fault conditions only for the period required by the switch to clear the fault. This time will be very short unless definite time relays are used with long settings. To ensure the maintenance of such a high standard of operation, the switchgear must be subjected to frequent examination and searching maintenance tests, which cannot always be provided. Consequently, where the possibility exists that switchgear may fail to operate due to either mechanical or electrical defects, the transformer must be capable of sustaining the fault current for a period determined by the time setting of the back-up protection, although as this is a condition which will not arise repeatedly, the possibility of damage to the inter-turn insulation under these circumstances is remote.

Effect of System Design

The type of fault most likely to occur depends largely on the particular design of a system, the simplest illustration of this being the different fault conditions arising on overhead and underground transmission. A large proportion of the faults on overhead systems occur between one phase and earth usually due to flash-over or mechanical breakage of insulators, whereas maintained faults between phases are comparatively rare due to the wide spacing of conductors, and the ability of air as an insulator to recover its dielectric strength after puncture. On the other hand, although the number of faults is usually much smaller on underground systems, those that do occur develop into a breakdown between phases. The maximum current value is usually considerably lower with an earth fault than a phase fault due to the resistance of the earth circuit; consequently the thermal stresses on associated equipment are much less. The use of a current transformer which is not as reliable as the associated system is not true economy, because its weakness reduces the reliability of the whole.

This remarkable picture of a welder at work is one of the sixty-four reproductions in "Photograms of the Year" edited by F. J. Mortimer, Hon. F.R.P.S., and published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, S.E.1 (5s. paper, 7s. 6d. cloth, net)

A LARGE TECHNICAL COLLEGE



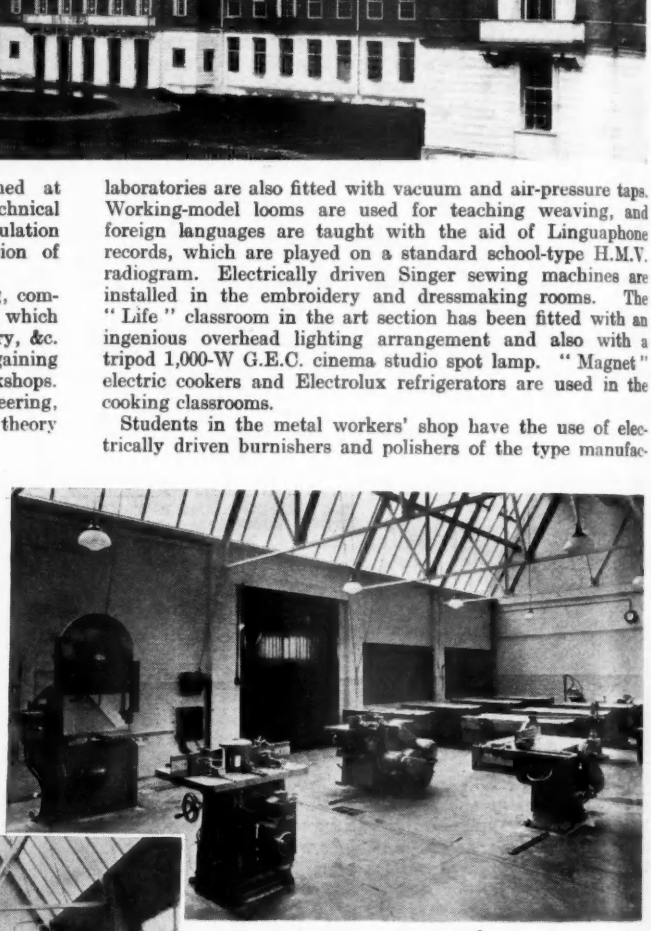
THE Essex Education Authority has established at Dagenham the first of two colleges to meet technical educational needs in a district where the population is rapidly increasing owing to the marked expansion of industry along the north bank of the Thames.

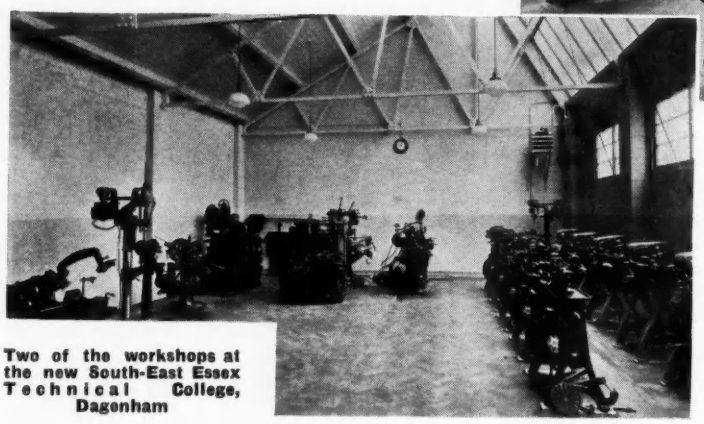
Day and evening classes are provided in engineering, commerce, art, domestic science and their allied branches, which include such subjects as electrical technology, chemistry, &c. In the Engineering Department there is scope for gaining practical experience in a series of well-equipped workshops. Courses in electrical engineering, including radio engineering, have been palnned to give students a useful amount of theory and practice in the minimum time.

When completed, the college and its full equipment will have cost about £200,000. The fees vary according to a fixed scale, but the normal for a full-time day course is £9 9s. per annum; in certain circumstances no fee is charged.

The long white building stands in large grounds, with playing fields for cricket, tennis and football. The college library has windows of " Vita-glass," and the separate tables are fitted with metal-shaded reading lamps.

In the long corridors small opaque bowls on wooden blocks, painted to match the general colour scheme, are situated at convenient intervals on the walls and give diffused light. Concealed lighting is a special feature that has been carried out most effectively. Even the blackboards in the classrooms are fitted with metal-shaded " runner " lights along the top, but the best example of concealed lighting is in the main entrance hall, where the ceiling contains a sunken rectangle with curved and moulded sides, like a small inverted Roman bath, the light flooding it from concealed apertures. The electrical fittings throughout were supplied by White Allom, Ltd., of Hanover Square, London.





Two of the workshops at the new South-East Essex Technical College, Dagenham

Above the main entrance hall steps a corridor runs to left and right and in this are arranged several neat shop windows where students can receive practical tuition in window-display methods. For tuition in shop management a classroom has been equipped as a complete retail grocery store, including counter, scales, proper shelving, glass showcases and a full range of goods.

In the chemistry laboratories each table is fitted with power plugs for use in electrical experiments; the tables in the senior laboratories are also fitted with vacuum and air-pressure taps. Working-model looms are used for teaching weaving, and foreign languages are taught with the aid of Linguaphone records, which are played on a standard school-type H.M.V. radiogram. Electrically driven Singer sewing machines are installed in the embroidery and dressmaking rooms. The " Life " classroom in the art section has been fitted with an ingenious overhead lighting arrangement and also with a tripod 1,000-W G.E.C. cinema studio spot lamp. " Magnet " electric cookers and Electrolux refrigerators are used in the cooking classrooms.

Students in the metal workers' shop have the use of electrically driven burnishers and polishers of the type manufactured by J. W. Carr & Co., Ltd. Each room is fitted with a Gent electrically synchronised clock.

The college has a restaurant, and in size the dining hall compares with the assembly room, which has a seating capacity for 1,200 people and a fully equipped cinema projector room.

Apart from those mentioned in the article, the following were among the suppliers of equipment: Taylor & Challen, Ltd. (power presses); W. & T. Avery, Ltd. (a " Wohler " type strength of materials tester fitted with an improved revolution counter); Quasi-Arc Co., Ltd. (workshop plant); Ford Motor Co. (laboratory set for testing car electrical equipment, including wireless); Marryat & Scott, Ltd. (lift); Cambridge Instrument Co. (workshop equipment); British Thomson-Houston Co., Ltd. (workshop plant); Lancashire Dynamo & Crypto, Ltd. (workshop plant); Crossley Bros. (workshop plant); and Wild-Barfield Co. (furnace).

Congress for Testing Materials

Among the papers to be presented at the International Congress of the International Association for Testing Materials, in London next April, Group A covers metals, comprising about seventy papers from thirteen countries. The British contribution includes sixteen papers, some by overseas authors. The subjects include metallography (micro-macrography, X-ray interference, electron interference, &c.). The hon. secretary of the Congress is Mr. K. Headlam-Morley, 28, Victoria Street, London, S.W.1.

Modern Printing Plant

Varied applications of electricity demonstrated at Olympia

THE ninth International Printing, Stationery and Allied Trades' Exhibition (Olympia: November 23rd to December 5th) is an extensive demonstration of the diverse uses made of electricity by printers and by the manufacturers of the various kinds of equipment used in the printing industry.

Since the last show, in 1929, applications of automatic control, motor driving, electric type-metal melting, electrotyping and pictorial process lighting have been materially developed. The constant demand for more speedy production without detriment to quality can only be satisfied by new methods.

Air suction and pressure are quite frequently employed for the manipulation of paper and the actuation of parts of mechanisms. These machines require small motors in addition to the main (often multi) drives and auto-control gear, as demonstrated by a number of manufacturers. For instance, Fuller equipments, to be seen working on various exhibitors' stands as well as the company's own, range from a 1-h.p. motor for a platen drive up to a complete news-press two-motor outfit of 100 h.p., a.c. shunt commutator type, with enclosed controller and push-button desk. In this range are a 5.5-h.p. d.c. variable speed equipment with push-button preset controller; and two variable speed a.c. shunt commutator sets, one fully automatic with motor-operated brush gear with wide speed range, and the other semi-automatic with mechanical remote control.

Similarly, Meech electric drives are shown on the stands of eleven exhibitors apart from the company's own display of a.c. and d.c. and flameproof equipments. J. Stone's positive infinitely variable speed and high reduction gear mounted on a combination bedplate with motor compactly localises the whole of the driving gear at one point, eliminating the need for special countershafts and plummer blocks.

There are examples of Morse chain drives for Fuller, Meech & Holmes printing press motors, while J. H. Holmes's exhibits include a "Cline" high-speed rotary press motor drive

[*Elec. Rev. photo*

Crabtree multi-motor printing press with "Selsyn" electrical synchronisation

with control board operated from push-button boxes for speed variation; duplex (two-motor) press drives and d.c. and a.c. motors for small rotary and flat-bed presses, including a.c. commutator variable speed machines; and also a reel carrier fitted with web tension gear, paper break detector and web severer.

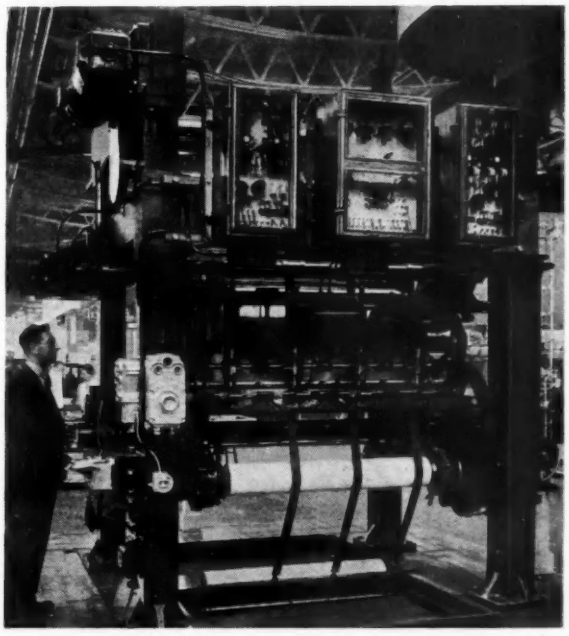
The Witton-James-Wood autopaster feeds fresh paper reels to a rotary web press, the joining up of the paper and severing being done automatically under push-button control at any running speed of the press up to a maximum of 60,000 copies per hour, so saving time and minimising defective printing. This exhibit is for export, as is also a 100-h.p. variable speed, three-phase, two-motor web press driving outfit with p.b. switch control board, utilising a commutator type main motor.

Among stereotypers' supplies are specimens of the S.D. Syndicate's engraving copper sheets manufactured by British Insulated Cables, Ltd., from selected billets by a special method that obviates grinding or buffing the sheets. The electrical etching of zinc and copper is demonstrated, together with the action of an electric dusting cabinet and the application of hot-plates.

"Actograp" electric pencils are offered by Lorant & Co., while a heavy current generator is specially designed by J. H. Holmes for electrolytic work. There are also Canning rectifier panels and low-voltage motor-generators for electroplating, vats for copper and chrome facing electros.

Motor-driven saw benches, routers, planers, drills, bevellers, &c., for electro and stereo finishing are offered by H. Williams & Sons; motor-driven matrix moulding presses by Knowles & Co.; and electric saws and engravers by Littlejohn & Co.

There is a Lakeman (M.A.N.) tilting machine for automatically casting flat stereos and for the backing up of electro shells under pressure. The "Trumax" precision planer for



[*Elec. Rev. photo*

Witton-James-Wood electric autopaster

metal mounts will cut to within one-thousandth of an inch; it is screw-driven by a built-in motor under p.b. control. This company's speed saw is of the direct motor-driven circular type; there is also a direct motor-driven bevelling machine, a combined jig-saw and drill with individual motors, and a hand-operated stereo moulding and drying press which is electrically heated under thermostatic control.

Electric Heating

Urgent work can be speeded up by the use of "Watford" (Hudson & Stracey) electric drying apparatus suitable for cylinder machines (with printed side up delivery). It is readily adjustable, can be quickly put into or out of use, and individual treatment can be given to a section of a sheet; the loading is 500 W per unit in use.

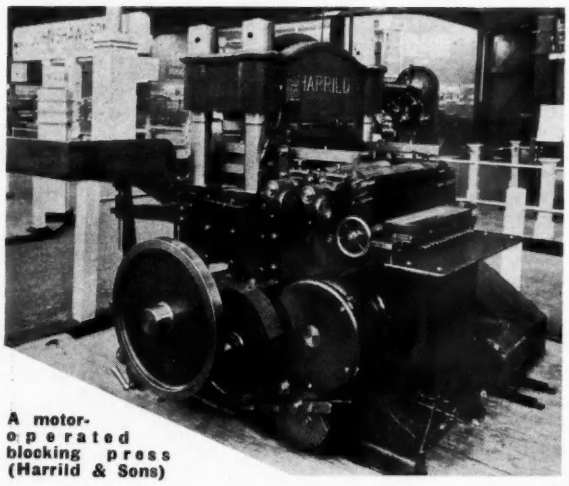
Composing and typecasting machines, motor driven, also melt the metal electrically. For example, the Intertype machines have a G.E. (American) pot heater with an expansion thermostat. Several other makers employ Funditor heaters fitted with thermostats arranged to tilt a mercury switch. The pot elements of the Monotype machines (which need both motors and air compressors) are of the immersion type divided in parallel, so that should one fail the other prevents the metal solidifying. Mica insulated curved strip elements are fitted to Linotype machines in the form of a pot jacket, each element being withdrawable without disturbing the remainder.

Other Funditor appliances include a motor-driven device for cleaning spacebands of Linotypes, capable of assembling thirty in a minute; another for cleaning the magazines of these machines with the matrices inside, is motor driven and equipped with an electrically heated drying tank. There is also a new rotary electric matrix scorcher with automatic control of both temperature and heating time, together with open

and closed metal re-melting pots thermostatically regulated and having a motor stirrer.

Harrild & Sons' electrically heated stereo equipment includes a metal furnace and casting box for flat plates with three-heat switching and temperature control and a hot press with similar fittings and a blocking press of 6.5 tons with inking, heat-insulated head and electric heating under thermostatic control.

Beside the Hoe matrix moulding press is an electric drying



A motor-operated blocking press (Harrild & Sons)

[Elec. Rev. photo

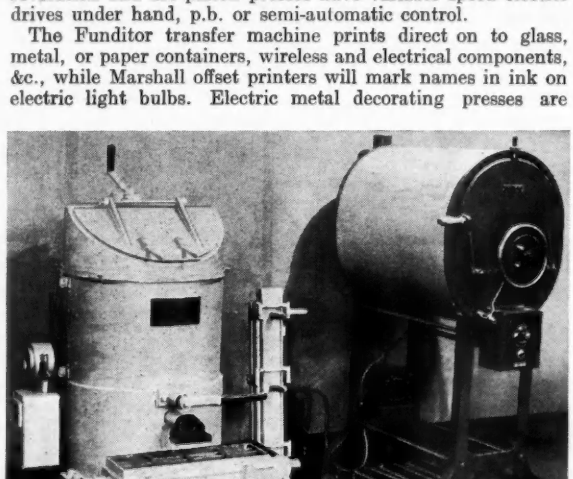
stand, while among the Crosland cutting machinery is a cardboard box embossing press fitted with an electrically heated plate, thermostatically controlled (by the Cambridge Instrument Co.).

Printing Presses

Typical examples of large presses are a Crabtree rotary unit capable of a speed of 60,000 copies per hour and driven by separate motors with "Selsyn" electrical synchronisation. Also single-, two- and three-colour offset machines with directly coupled drives (no belts or pulleys) with full control by push-buttons.

The Hoe fourteen-page unit will print, fold and deliver newspapers at the rate of fourteen copies per second. On the American Miehle Co.'s stand is a feeder (new Dexter design) of the reloading pile type which is raised and lowered by motor power with travel-limit switches. Burt & Sons' two-revolution and art platen presses have variable speed electric drives under hand, p.b. or semi-automatic control.

The Funditor transfer machine prints direct on to glass, metal, or paper containers, wireless and electrical components, &c., while Marshall offset printers will mark names in ink on electric light bulbs. Electric metal decorating presses are



[Elec. Rev. photo

Electric metal re-melting furnace (left) and rotary matrix scorcher (Funditor)

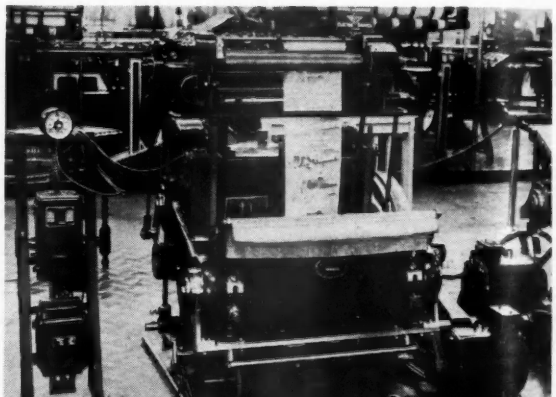
shown by Dawson, Payne & Elliott, as well as Mann & Co. and Ratcliff & Sons, capable of printing on tin sheets at the rate of 4,000 impressions per hour.

At the other extreme are electrically actuated Addressall machines for listing and addressing at speeds up to 8,000 copies per hour. The International Time Recorder Co.'s electric writer can be described as a power-operated typewriter, being quicker and reducing operator fatigue. Up to twenty copies are obtainable and an extra long carriage can be fitted for statistical work. Electric "Laugapers" (Block & Anderson) are versatile machines generally used for overprinting and infilling on almost any surface or material; they are light and portable. The Addressograph-Multigraph can now be electrically driven, while the Hayward addressing outfit can also be employed for printing in column form on to pay sheets, electricity ledgers, &c., the selection of stencils being automatic with electric models.

Accessory Machines

Specialised Igranic control gear needs no introduction; this company also makes electric brakes, a new electro-magnetic web-severing knife for high-speed presses, and a 1.5-h.p. motor-operated pack-wrap press for tying newspapers into bundles. The "Challenge" (Funditor) machine is driven by a small motor and will drill, slot, slit, and round-corner piles of paper. The "Simplex" rotary perforator is likewise driven by a tiny motor.

There is an electrically driven Ludlow and Elrod machine for producing spacing material and rules, while Harrild & Sons offer a vacuum cleaner for type cases, &c. Beside the Lotz Abbott gummer there are Ritchie glueing and cardboard box making mechanisms, with direct motor drives. The latest Waite & Sheard automatic triple striker pen ruling machine is fitted with an auto-pile suction feeder and is driven by direct gearing by an independent motor, which method is not only



[Elec. Rev. photo

Cardboard box embossing press with electrically heated plate (Crosland)

more accurate but needs no more space than a machine driven by hand. The Halley jogger is complete with a built-in motor and is adjustable "on the run." The Smyth-Horne auto-spacer-cutter has a switch button for changing-over the guillotine from automatic to hand control.

The Caxton all-electric routing machine is for light duty. Among Jagenberg cardboard-box-making devices is an auto-web-steering appliance and suction brake; by means of an electrically controlled differential the parent reel is kept central no matter how much the reel is telescoped. Fuller electric pulley block equipment of one-ton capacity is exhibited beside a one-ton battery-propelled truck with an elevating platform. Electric master impulsing clocks and workmen's and watchmen's automatic time recorders are exhibited by the National Time Recorder Co., Gledhill-Brook Time Recorders, Ltd., and the International Time Recorder Co. for a.c. and d.c. circuits.

Special Lamps

For local illumination on machinery the Igranic "Lo-volite" operates on the safety step-down transformer system. Mek-Elek adjustable bracket-arm fittings provide intense local light while shielding the worker's eyes from glare. They can be used with 12-V step-down transformers to avoid earthing and to enable a robust filament to be employed where there is vibration.

Elkay artificial daylight lamps employ a "Nova Lux" blue-glass filter. There are reflectors for most requirements and "corrected" light is obtained by eliminating the red rays. The Johnson-Baker exhibit illustrates news counter and shop window illumination. Arc lamps and photo-reproduction equipment are displayed by Littlejohn & Co., Pictorial Machinery Co. (also portable electric air brush outfit), Heidenhain (Berlin), Hoh & Hahne (Leipzig), and Ilford, Ltd. Greig & Sons' automatic guillotine is fitted with a floodlighted table and gauge.

A Television Laboratory

IT is not the policy of the Edison Swan Electric Co., Ltd., to manufacture complete television receivers. It is, at present, confining itself to the supply of a range of essential components, mainly cathode-ray tubes, special receiving valves, rectifiers, thyratrons, transformers and loud speakers, which are made by the company itself or by associated concerns.

The television laboratory at Ponder's End

For the specialised testing of cathode-ray tubes and experimental investigation into their design and production a separate laboratory has been established at the Ponder's End works, within a few yards of the original building in which Sir J. A. Fleming made the first radio valve.

A range of tubes is offered with screen diameters of 5, 7, 10 and 12 in. Types 5 H and 7 H are intended for ordinary oscillography, or for monitoring television transmitters or experimental scanning equipments. Types 10 H and 12 H are essentially for use in domestic television receivers. They produce black and white pictures, and all have two pairs of plates for electrostatic deflection of the beam.

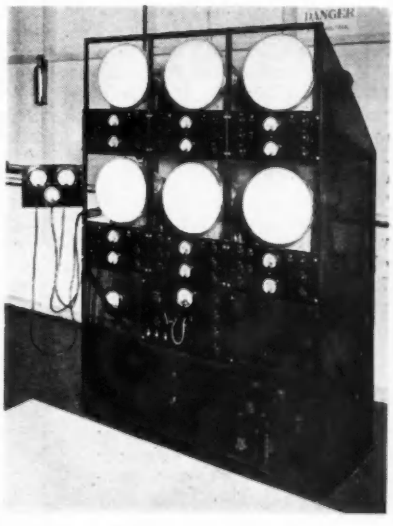
Cathode-ray Tube Production

The latest high-vacuum tubes are claimed to possess highly luminous screens, improved focusing properties, freedom from cathode disintegration due to ionic bombardment and improved modulation characteristics. They are manufactured in the special valve factory at Ponder's End. The clear-glass bulbs are blown at the Chesterfield factory and sprayed with the fluorescent compound by a process which excludes any foreign matter, such as dust, likely to spread in the later process of baking and cause unsightly blemishes.

The electrodes, &c., are hand assembled with the aid of jigs and held securely in their correct positions by spot welding. Mica separators and insulators are used throughout. The nickel cathode is indirectly heated and is coated with a barium compound at the top end of the cylinder and not along the sides as in the ordinary radio valve. The complete electrode assembly is mounted on a glass pinch in the bulb and sealed off in a rotary machine. The tube is then exhausted on a rotary machine which automatically applies the necessary high temperature for baking out occluded gases. Voltage is also applied to the heater to activate and out-gas the cathode, and high-frequency heating is employed to volatilise the barium-getter to ensure further liberation of gases.

Tests include the checking of the cathode emission, screen brightness, shape of scan modulation characteristics, cathode-heater voltage and current, shift of scan with grid control, and variations in anode volts for spot focus within prescribed limits. All tubes are tested at excessive voltages to ensure that no breakdown or flash-over can occur. A number are taken from each batch produced and run under television scanning conditions at full operating voltages and current on the life-test rack. The tubes are packed in specially constructed sprung crates to guard against damage in transit.

The three receivers used in the laboratory were developed with the sole object of testing components under actual working conditions. One of them is a "panel" model, now used for monitoring. The other is a cabinet model with two speakers and a horizontal cathode-ray tube for direct viewing. This set contains refinements to enable it to be used as a standard for comparing less costly (commercial) sets. Both these sets were in use experimentally, before regular transmissions commenced, with the aid of locally modulated oscillators and impulse generators made to simulate the synchronising impulses which are now radiated on the Baird and Marconi - E.M.I. systems.



Cathode-ray tube life-test rack

The third (domestic) receiver is a simplified type in a smaller cabinet with a single speaker and a vertical cathode-ray tube, the picture being viewed indirectly in a mirror in the lid. The mirror is made by condensing aluminium on glass by the "Metro-Vick" atomic volatilisation process.

New Books

Electricity and Magnetism for Engineering Students. By A. W. Hirst. Pp. 388; figs. London: Blackie & Son, Ltd. Price 15s. net.

This book is primarily for students in the higher forms of public and secondary schools. Its scope is intended to cover the requirements of the Intermediate B.Sc. (Eng.) examination in electricity and magnetism, but many parts of the book are suitable for the first year of the final course for the B.Sc. (Eng.) degree. Mathematical proofs are given freely whenever occasion demands, and the student is properly expected to have a sound knowledge of mathematics, including the calculus and simple differential equations. A commendable feature is that the proofs are given in full, so that the student is able to follow all the steps.

After a preliminary discussion on units and mechanical principles, elementary ideas of electricity and matter are introduced, followed by magnetism and magnetic theory. The author then returns to the electric circuit and electromagnetism. These chapters occupy nearly one-half of the volume. The subject matter is dealt with in a clear style and is not swamped by needless descriptive matter.

The principles of alternating current are dealt with in a very short chapter (20 pages), and those of electrical machines (d.c. and a.c.) and the transformer are confined to 30 pages. The final chapter gives the student a clear insight into electrostatic principles and theory. It includes such items as the calculation of electric force, capacitance, charge and discharge of a condenser, &c.

A valuable feature for the student is the large number of worked examples which are included in the text, and the examples for test at the end of each chapter, answers being given to the numerical problems.

Electronics and gaseous discharge phenomena are not included. This subject is becoming of increasing importance at the present day and the brief mention in Chapter II of the electron theory is inadequate for a B.Sc. (Eng.) course.

Wireless Engineering. By L. S. PALMER. Pp. 544; illus. 353. London: Longmans, Green and Co. Price 21s. net.

This book is based on the author's "Wireless Principles and Practice" which was published in 1926; in fact, most of the matter which is still up to date in that book is incorporated in the present work, which includes new sections on the various developments in the last ten years, including

short-wave and microwave theory and practice, quartz oscillators, radio-cable links and the recent advances in our knowledge of the propagation of wireless waves.

This is a textbook for the electrical engineer and the student with electrical knowledge who wishes to cover the ground for university degrees or examinations of the City and Guilds Institute. It thus assumes a knowledge of electricity and includes a fair amount of mathematics. The text covers the general principles of the whole subject, but detailed commercial practice is outside the scope of the book. Some of the wording and captions to illustrations in the chapter on arcs and high-frequency alternators, which is taken from the previous volume, leave the impression that these systems are still in use commercially, which is not the case. Apart from this small criticism we have noticed nothing carried into this book which has become obsolete since the former one was published, and the new matter is up to date, well set out and carefully selected.

Der Wert der Wärmeersparnis. By DR.-ING. F. NEDDEN. Pp. 163; figs. 22. Berlin: R. Oldenbourg. Price Rm. 8.

This book deals with the economic value of heat-savings in the generation of electricity, the theoretical consideration of the subject being applied to German and American statistics for pre-war and post-war periods, leading to practical conclusions of direct applicability to schemes of central station construction and rationalisation. The author has devised a presentation which is very convenient in the present instance and might well be considered by the authors of other monographs. The theoretical bases of the study are placed in the appendix, the statistics and their analysis are given in the central part of the book, the practical application of the principles, formulæ and data is treated in Part I (about 27 pages) and, in front of all, there is a three-page summary providing a clear statement of the results of the whole work. In this instance, at least, the deliberate placing of the cart before the horse is entirely justified.

From an analysis of the significance of the ratio of running to fixed costs there follows a simple formulæ for the present capital value of 1 per cent. saving in fuel consumption, which is of cardinal importance in the planning of new installations or modernisation schemes. The analysis of capital cost, fuel cost and load factor statistics for American and German plants over a long term of years shows the much higher capital value of fuel economy in the United States than in Germany, the ratio being 2½:1 in 1925-26. During recent years, the capital value of a 1 per cent. saving in fuel has decreased in both countries; and the author states that in the immediate future it is likely to be about 1.5 marks per kW in Germany and 70 cents. in the United States. The outstanding general conclusion to be drawn from this helpful publication is the overwhelming importance of reducing capital charges, particularly as regards the investment in distribution systems. Attention is also drawn to the economic distinctions between ordinary central stations and those which also render district heating service; and there are useful sections on employment questions, and the bearing of boom and depression conditions on electricity generation economics.

Electric Drives at a Battery Works

THE diversity of applications of the electric drive in an electric accumulator works is well illustrated in the factories of the Tudor Accumulator Co., Ltd., Dukinfield, for which the General Electric Co., Ltd. has recently manufactured and supplied a large number of "Witton" motors.

A large part of the works is devoted to the production of accumulator plates. Positive plates of the Planté type are cast from pure lead. The moulds for the plates are fed from cylinders immersed in the molten metal, the cylinders being fitted with plungers having adjustable strokes so that the correct amount of metal can be discharged to moulds. Compressed air is used for the operation of the plungers, and also for pressure-casting the box frame of antimonial lead, which is required for stationary negative plates. Either one of the duplicate air compressors can be driven by a 30-h.p. 720-r.p.m. motor. After being cast, the positive plates are placed in a stamping press, which shears off the excess metal from the lugs and the sides of plates. A 10-h.p. motor drives two of these stamping presses and also a small exhaust fan to remove fumes or dust.

As Planté plates must be formed within narrow limits of temperature, during the summer months the formation tanks are cooled by water which is circulated through lead pipes after being chilled in a carbon-dioxide refrigerator plant driven by a 45-h.p. motor. The negative plates and the pasted positive plates, which are used in batteries for vehicles, submarines, car starters and wireless, consist of antimony-lead grids to which a paste is applied, consisting of a mixture of lead oxides and other ingredients. Certain special oxides are manufactured at the company's works. The paste-mixing machines are driven by 15-h.p. 720-r.p.m. motors. Situated on the floor above is a barrel-dumping machine, driven by a 1.5-h.p. motor which empties the drums of lead oxides into the mixing machine without permitting any to escape to the atmosphere. The total capacity of fifteen motors employed to drive fans for the removal of traces of lead oxide from the work benches amounts to 44 h.p.

A joiners' shop for the production of battery stands, wood cell boxes (which are subsequently lined with sheet lead) and hardwood crates for vehicle batteries forms an important section of the works. A number of the wood-working machines are driven by a 20-h.p. motor, generally through countershafting and belts. Sawdust and wood-scrap are sucked away from the working points by a 15-h.p. exhaust fan and are delivered at the boiler house, where low-pressure steam is generated for heating the works in winter and for process work.

Another shop is devoted to the manufacture of wood board separators employing thin diaphragms as used in stationary cells. The wood logs from which veneer is obtained are first of all placed in a tank of boiling water for some hours and are then transferred to a machine (driven from countershafting by a 20-h.p. motor) where the log is rotated against a knife so that a veneer in the form of a long sheet is obtained. A number of saws, planing machines and other wood-working appliances are also installed in this shop.

Above: Exhaust fan belt-driven by a 15-h.p. motor. Left: Paste-mixing machine driven by a 15-h.p. motor

Scrap plates are dealt with in a reducing furnace, and sediment and certain waste lead products from the works in a blast furnace. Scrap lead, together with limestone, flux and coke fuel is fed in at the top of the furnace and an air blast is blown by a 5-h.p. fan through tuyères near the bottom of the furnace. The reduced lead is collected in a well at the bottom of the furnace and is tapped off at intervals. All of the moulds employed for the casting of plates and grids (some very complicated) are produced in the mechanics' shop, an important part of the company's works, where motors totalling 16-h.p. in capacity are installed.

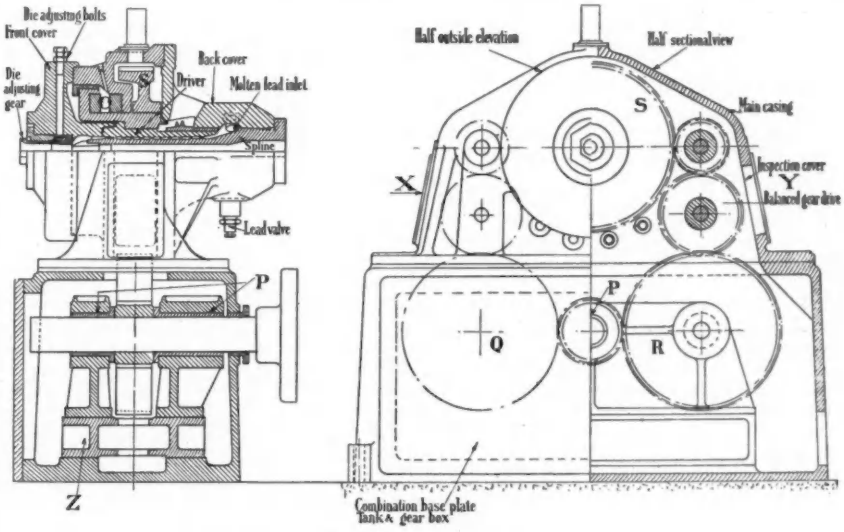
Meetings and Discussions

This week's I.E.E. paper was a description by Dr. P. Dunsheath of the continuous lead extrusion machine which he has designed to overcome defects inherent in earlier methods of cable sheathing. Mr. G. C. Marris, a well-known authority on the subject, presented at last week's meeting of the A.S.E.E. an account of the principles underlying successful television. At an informal meeting of the I.E.E. the technical side of electric vehicle design was discussed, the opening speaker being Mr. L. Murphy

Continuous Cable-sheath Extrusion

A PAPER read by Dr. P. Dunsheath before the INSTITUTION OF ELECTRICAL ENGINEERS yesterday described a new method of continuous extrusion of lead-cable sheaths. In this the pressure is obtained by means of a motor-driven screw member instead of by the ram of a hydraulic press as generally employed hitherto. The paper also discussed improved lead-handling and melting equipment and an automatic reeling mechanism for the handling of the finished cable.

Continuous extrusion, the author states, keeps a steady load on the press, increases the uniformity of the product and reduces the amount of lead required. Moreover, with the hydraulic process, welds between separate faces of metal are included in the finished pipe. These welds being slightly oxidised often prevent the sheath from becoming a homogeneous mass throughout its length and thus introduce local lines of weakness. The segregation of the oxides and impurities due to successive charges may result in incipient splits in the lead which open up with vibration or heating after the installation of the cable. When a hydraulic press is stopped for recharging the lead container, there is a danger that the sheath may be stretched due to the relative movement of the pipe and the lead in the forming chamber resulting from the relief of pressure on the ram.



Arrangement of the Henley continuous extrusion machine
P. Bearing, Q.R. Side wheels, XY. Inspection doors, Z. Cast stool

Experiments by the author from 1929 onwards leading up to the completed design are described. In its ultimate form the machine consists of two units; the upper includes a cast-steel casing carrying back and front covers, lead-impelling portions with molten-lead chamber, point-holder, driver with thrust bearing and die-adjusting mechanism; the lower part is a cast tank base which houses reduction gear and oil for the thrust bearing and gear wheels.

Driving arrangements have to cover the requirements of starting when the lead is cold to the torque required when it is warm, which varies with the thickness and hardness of the sheath. A range of machines extruding up to 5-in. diameter cable core has been standardised. The motor on the Type I machine, capable of dealing with 1-in. diameter cable core, is a drip-proof separately excited interpole machine with stabilising turns. Economical operation between 30 and 1,350 r.p.m. is achieved by a combination of Ward-Leonard and shunt control, the speed remaining constant at any given setting of the regulator irrespective of variations in the motor load.

The switchgear comprises a starter for the motor of the motor generator, a contactor panel in the circuit between the generator and the main motor driving the extrusion machine together with overload relays and an ammeter shunt and a main control pillar. The last-named embodies the controls for the operation of the electric drive and for cooling and lubrication and temperature indicators. One hand-wheel operates a potentiometer regulator for the shunt field of the generator when the main motor is under Ward-Leonard control at lower speeds and also a shunt regulator for the main motor field at the higher speeds.

Continuous cable sheathing
High-definition television
Electric vehicle design

The weight of sheathing extruded per hour varies from 2,000 lb. for the smallest machine (equivalent to 450 yd. of cable with 1-in. dia. core) to 4,000 lb. (200 yd. of 3-in. cable) for a 3-in. machine. With hard alloys, *e.g.*, 0.85 per cent. antimony, the output is reduced by 20 per cent. For driving the Type I machine about 20 h.p. is required for most sheaths, but 35 h.p. is provided.

Thermo-couple tests have shown a die temperature constant at 400 deg. F. over long periods, whereas with a hydraulic press variations between 302 and 390 deg. were noted during each charge. With continuous extrusion lead oxides do not exist and crystal structure is remarkably uniform. The sheath has negligible variations on longitudinal dimensions and requires a tolerance of not more than 3 per cent. around the circumference instead of the 10 per cent. permitted by the B.S.I. (which is often required by the hydraulic press) thus improving the product as well as saving lead.

At the temperatures employed in the lead pot (up to 750 deg. F.) the surface of the metal rapidly oxidises so that the pot requires frequent cleaning. Drossing commonly results in a loss of up to 2 per cent. of the lead, costing £30,000 per annum in this country, and involves labour charges in skimming. Also certain alloying metals oxidise more readily than the lead and upset the percentage. Various methods of overcoming oxidisation are described.

For melting one ton of lead 56 to 77.2 kWh by electric heating and 1.86 to 5.62 therms (equivalent to 54.6 to 165 kWh) by gas are needed by various types of furnace, compared with theoretical values of 25.9 kWh and 0.88 therm.

Operation of the cable sheathing plant described is carried out almost entirely from the control pedestal and once the magazine has been charged with twenty pigs no more attention is required at the melting end except to fill the magazine once or twice an hour.

Television Considerations

TELEVISION was the subject of a lecture delivered by Mr. G. C. Marris (G.E.C. research staff) at a largely attended joint meeting of the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS and the INSTITUTION OF ENGINEERS-IN-CHARGE in London on November 25th.

The author confined himself to a plain description of the principal technical methods by which modern high-definition transmission and reception are accomplished. He dealt, first, with "scanning" for translating the picture, point by point, into an electric current by means of photoelectric cell convertion proportional to the brightness. He said that its limitation was lack of sensitivity; a candle, a foot away from a normal cell, might give ½ mA (10 mA per lumen). Recent developments of so-called secondary emission photocells had been very useful for television, giving a sensitivity four or five times greater.

The principles of scanning by disc and cathode-ray tube were outlined, and a table of comparative brightness of different sources of light showed that the cathode-ray tube had already exceeded the brightness of the average home cinema screen. The cathode-ray tube at 4,500 V produced 0.003 ft. c. per cm² or 8 ft. c. (effective). This was in part due to research carried out on the fluorescent powders of which the screen was composed. The zinc and calcium salts used required to be of extreme purity with exceedingly minute, but accurate, amounts, perhaps 1/1,000 of one per cent. of added metallic salts. If the standard full-size cinema picture were taken as an ideal, Mr. Marris said he would have to admit at once that it was beyond present day television technique.

The most sensitive spot in the retina of the eye was nearly a millimetre in diameter and it consisted mainly of little cones 0.003 mm. apart, each of which seemed able to communicate with the brain. As the focal length of the eye was 22 mm. it could not separate objects less than 28 seconds of angle apart. Actually about one minute of angle seemed nearer the fact for a normal eye. This meant distinguishing 0.15 mm. at 50 cm. distance or, say, 1/25 in. at a distance of 10 ft.

The best lenses used in taking cinema pictures would not give a perfect image of a point; the smallest element of image they could produce was about 30 thousandths of a millimetre. On standard cine film 22 mm. by 16 mm. this corresponded to about 800-line definition, or about 400 lines on home cine size. If the picture were of 240 lines and 6 in. high it must be viewed from 7 ft., or fourteen times the height of the picture away. A ratio of between 4 :1 and 8 :1 was said to be best.

With interlacing each picture was scanned twice, missing alternate strips the first time and looking at them the second. Thus the spot of light travelled along a path that had the effect of doubling the frequency of the scan.

An iconoscope (image viewer) combined a great many photo-electric cells by depositing on a plate minute globules of caesium metal. Such a mosaic might contain several million globules inside an evacuated bulb and so connected in an electrical circuit that each globule formed a little condenser between itself and the conducting back plate.

An electron beam was made to scan it and the picture to be transmitted was focused on it. In the dark, the beam electrons each time the beam reached a globule charged it up to a definite voltage (determined by secondary emission); all the little cells reached a steady potential. Wherever there was light on a patch from the image, photo electrons went to the anode making the patch more positive. Next time the beam came it gave up some electrons to this patch, which had lost them, and so caused an impulse of electricity in the amplifier connected in the circuit.

The extreme importance of the iconoscope arose from the fact that the light from the image could do its task of releasing photo-electrons all the time, while the electron beam itself was away scanning some other part of the picture. The beam returned every 50th of a second, say, but was actually dwelling on a picture point for only half a millionth of a second. In nearly every other system the photocell was only allowed to look at the object for the time taken to scan one picture element.

For short wavelengths (about 7 metres) it became practical to use as an aerial a short vertical piece of wire or rod about one half wavelength long supported by insulators away from earth; a usual length was 10 ft. 5 in. Such a dipole could be connected to the terminals of the receiver by two wire feeder taps on to a section in the middle, the tapping points being chosen to match together the impedance of aerial and feeder. The most suitable feeder was a concentric cable having a single central wire and outer cylindrical conductor separated by insulation chosen for its low dielectric losses at high frequencies. Such a construction was largely immune from outside interference, and could be handled like any other cable.

A short wire attached directly to the set was unsatisfactory because it might be subject to variation of signal strength if objects in the room (including persons) were moved, since any conducting body of approximately half wavelength dimensions could resonate and act as a reflector. A dipole well clear of the building avoided these difficulties. The signal strength in the dipole could often be greatly increased by supporting one or more insulated dipoles suitably disposed near it, which acted as reflectors to concentrate the field upon it.

Electric Vehicles

SOME technical aspects of electric vehicles were discussed at an informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 23rd. The first speaker, Mr. L. Murphy, used tables and graphs to compare the electric with petrol-, horse- and man-propelled vehicles.

A chart showed that in the case of local work the electric vehicle was supreme and that, having a reasonable speed, it could be relied on to carry out the delivery round in less time than a much faster petrol vehicle, even when all the available speed of the latter was put into operation, the chief assets of the electric vehicle being ease of access to the driving position and the elimination of all complicated operations in starting up. In this respect it was unique and quite 20 seconds per stop might be saved against the petrol vehicle.

Vehicle weight could not be assumed constant for all speeds; a vehicle designed to travel at 40 m.p.h. must be considerably heavier than one for 15 m.p.h. The increase in weight of the motor alone would be about 200 lb. The net practical result was that something under 40 m.p.h. had to be accepted, so that until battery performance and cost had been greatly improved the petrol vehicle would hold the field in this sphere.

For exceptional cases (gradients steeper than one-fifth) a two-speed gear was desirable, but should be avoided as far as possible. The correct practice was to design the motor to operate at the highest possible rotational speed so that a steep gear ratio on a single gear could be employed. Such a motor would have the maximum efficiency and overload capacity for minimum weight.

These considerations led to the adoption of a two-pole design with short magnetic circuit. This type also avoided appreciable magnetic dispersion so that natural commutation was easily obtained even with a very unsaturated motor. This type compared well with the 4- and 6-pole designs of similar output and speed on all performance factors and on cost. It could not be too greatly stressed that the copper resistance of any traction motor must be kept to the absolute minimum. This maintained efficiency on overloads and was far more important than actual maximum efficiency, although the maximum need not be sacrificed on this account.

Radio Valve Design

THE geometrical design of radio receiving valves and such mechanical and chemical factors as impose manufacturing limitations are dealt with in a paper by Messrs. M. Benjamin, C. W. Cosgrove and G. W. Warren (of the M.O. and G.E.C. research departments) which was read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 2nd.

The minimum tolerances to which it is possible to reproduce characteristics are indicated, while details of the most recent emitter improvements and of the precautions necessary in the production of oxide-coated cathodes and insulated heaters are included. Pumping and activation processes are described, and the main factors affecting the life of a valve are discussed. Finally the authors deal with methods of minimising hum, microphony, noise and frequency limitation.

Reviewing past tendencies, the authors state that policy, dictated by competition, has resulted in the frequent introduction of new types and a general lack of standardisation between the products of various manufacturers. Such competition has made the attainment of economical and accurate production difficult, and, moreover, the short active life of individual types has hindered the study and correction of faults arising in service. During the last year or two there has been some abatement in the rush of new types and a more intensive concentration by manufacturers on such factors as reliability, uniformity, and economy. At the present time the radio industry in this country would appear to be entering a period of more intensive competition than ever before, and manufacturers will strive to secure the best value of performance for a given cost while retaining a satisfactory level of reliability and uniformity.

It would seem that there is still room for improvement in valves used for the shorter wavelengths, particularly in the region between 6 and 8 metres, which is now of such interest for television purposes. One of the items outstanding in this direction and which is receiving much attention at the present time is the frequency-changer. Operation down to 3 metres may become necessary if a number of television transmitters have to be accommodated in a restricted area. A further item of considerable interest at the present time is the provision of valves suitable for wide-band amplifiers. Also practical demonstration has already been given of a secondary-emission multiplier operating from a light source and giving a marked improvement in signal/noise ratio. It seems probable that if a grid electrode were introduced before the first collector, so that normal amplification became possible, the advantages in respect of noise would disappear. Such an arrangement would make possible a very high order of amplification in a very small space and would offer many advantages in the rather limited field of high-gain amplifiers. Recently serious attention has been given to the design of amplifying devices based on deflecting a beam of electrons rather than controlling the intensity of an electron stream, but there have been no outstanding developments except in very specialised cases.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Engineering Education

I was very interested to read the letter by Mr. D. Maclaren Cathcart which appeared in your issue of October 30th. My observations, extending over a period of about thirty years, have shown quite definitely that the most valuable men, and those who are selected to fill the more responsible positions in life, are those who have had a good general education in addition to the specialised education necessary for their chosen life's work.

We have all seen and known men who have done brilliantly at the University, but who have never got very far in life afterwards, just as we know men who have not done more than averagely well at the University, but who have filled important positions with success. The former class always talks of "pull," "favouritism," and so forth. In most cases the real reason for the success of the apparently average men is that they have had a good general education which has enabled them to deal with human and business problems as well as technical matters. C. E. OLIVE, B.Sc. (London).

Drummondville, P.Q., Canada, *November 17th.*

Impulse Voltages on Transformer Windings

The report on page 676 of your issue of November 13th of the discussion at the meeting of the Institution on November 5th indicates that I stated "If end shields created disturbances, then designers must be able to predict it." This is incorrect. My recollection (and reports I have received from other sources) is that I stated that end shields were good and were a particular form of adding capacitance as suggested by the authors on page 18 of their paper. Further, I stated that to make use of the results of this paper and similar investigations, it was necessary for designers to be able to predict the initial voltage distribution under the application of an impulse.

H. S. HOLBROOK.
Chief of Transformer Engineering Dept.
British Thomson-Houston Co., Ltd.

Rugby, *November 30th.*

Solving the Unused-capacity Problem

An increase in output from 15,890 million kWh in 1934-35 to 18,415 million kWh in 1935-36, a 15.9 per cent. rise in twelve months, is probably a result unsurpassed in any country in the world. But this output, large as it is, represents less than half the amount of energy the generating plants and mains already in use are able to provide.

The revenue derived from this supply (which we may term service "A") is sufficient to cover all the expenses on generation, transmission, administration, repairs and upkeep, capital redemption and sinking fund charges, together with profits. The unused potential supply may be called service "B." In order to supply this additional service, *viz.*, the extra 18,415 million kWh to consumers, the only substantial additional burden of expense imposed upon the industry is the cost of the extra fuel involved in its generation and distribution, all the other items being already covered by the existing service.

Reference to the official records of fuel costs shows that a unit of electricity can be generated by modern plants, such as are now operated by the Central Electricity Board, at a cost not exceeding one-eighth of a penny under the existing service "A." This one-eighth represents the cost with the generators working on an average of about half their full and most economical load; moreover, this figure covers also the generating and sub-station losses. These will not be repeated in doubling the output and sales under service "B." It is equitable and safe therefore to assess the actual cost to the industry of the additional service "B" at one-tenth of a penny per unit delivered to consumers already taking service "A," with satisfactory profits, therefore service "B" can profitably be provided at ¼d. per kWh under normal conditions and at one-fifth of a penny under specially favourable conditions.

In building up service "B" it is important that no adverse elements or conditions be introduced which would prejudice service "A" or militate against its continued healthy growth. Average distribution costs as service "B" grows will decrease to the advantage of both the services.

The regulations imposed upon service "B" should be generally as follows:—

(a) That the supply shall be used for heating and cooking operations embodying thermal storage and for battery-charging purposes only.

(b) That the units supplied under "B" shall be additional units to service "A" and not substitutional.

(c) That in no circumstances must service "B" add anything to the maximum demand required to furnish service "A."

(d) That all units supplied under service "B" shall be independently metered.

(e) That in no case shall the possible maximum demand under service "B" to any consumer exceed one-third that already required in providing service "A."

These easily understood general conditions provide the necessary safeguards for the continued expansion of business under service "A" while the low flat-rate tariff for service "B" will at once open out a new field of immense importance, profitable to the undertakings and of great benefit to the general public. Present consumers under service "A" will not be slow to avail themselves of service "B," indeed the offer of "B" will be one of the most effective means of getting additional consumers under service "A," while it will open up, on practical lines, an enormous new field.

Again, not only will additional meters be called for from the manufacturers, but new and more efficient plant will be forthcoming both for cooking and heating purposes on thermal storage lines. Space heating will be carried out extensively by heat storage convection heaters in place of the present uneconomical electric fires, the latter, of greatly reduced wattage, being used more especially to provide "atmosphere" while the thermal storage heaters assume the main burden of heat supply.

The acquisition of the additional business under "B" will not only provide a desirable heat supply but it will also benefit the "A" service by reducing its cost and thus contribute to the prosperity and benefit of the whole nation. The "B" service should more especially be welcome in the densely populated manufacturing districts where smoke and dust militate so seriously against the health and happiness of the working population.

The safe maximum "B" supply available at the present time is not less than 18,500 million kWh per annum. This represents not less than 62,900,000 million British thermal units. Taking relative efficiencies as 50 per cent. for coal

Special Christmas lighting at Selfridge's, employing 5,000 lamps, forty 500-W floodlights, 15,000 yd. of wiring, six motors and twelve flashers

[Elec. Rev. photo.

Another Plan for the Supply Industry

P.E.P. amplifies its proposals

THE latest publication of P.E.P. (Political and Economic Planning), a non-party organisation for the study of social questions, is a survey of the electricity supply industry with proposals for the reorganisation of electricity distribution (P.E.P., 16, Queen Anne's Gate, S.W.1, price 6s. net). It is a considerably expanded version of the brief report published at the beginning of last year. The first ninety-seven of the 164 pages is an able summary of the history of electricity supply and an exposition of its present structure. The nature of the market is thoroughly analysed with a view to showing the trend of development and future possibilities.

In framing its recommendations for the reorganisation of distribution the P.E.P. Electricity Group has been guided by eight principles:—The removal, by legislation, of anomalies and restrictions outside the undertakings' control, and abuses of control; the proper assessment of the efficiencies of individual undertakings; the preservation of efficient undertakings; recognition of the fact that size and efficiency are not directly related; that amalgamations are no guarantee of efficiency; that the form of control (local authority or company) is not a major factor in efficiency; that areas may be either too small or too large for efficient operation; and that management may of itself make an undertaking efficient or otherwise.

With regard to size it is pointed out that complexity of administration may result in decreased efficiency and loss of the personal contact which characterises small undertakings: the "medium-sized" undertaking seems to be favoured. An efficient undertaking is considered to be one which provides a full and economic service to all classes of consumer and has planned ahead to provide such a service to potential consumers. The functions of management bearing on efficiency are technical, commercial, economic and financial. It is stressed that price reductions are not the sole index of efficient and good electrical service.

A Committee of Investigation

The group's proposals for legislation are divided under five heads. The first covers the appointment of a Committee of Investigation by the Government in consultation with the Electricity Commission. This Committee would consist of not more than five full-time paid persons with experience in the control and operation of undertakings (technical and commercial) and a knowledge of the general economic conditions governing electricity as a public service. It would determine the administrative and technical conditions governing efficient distribution and examine existing undertakings to determine their capacity for future efficient development. In the light of this examination the Committee would determine the methods by which inefficiencies in distribution could be remedied and to what extent existing areas could be remodelled and the undertakings amalgamated or co-ordinated. Terms of payment for the acquisition of undertakings would be recommended; the exercise of purchasing rights vested in a proposed Electrical Development Authority would be determined; and the Committee would decide the desirability and methods of standardising systems in non-standard areas.

The Committee would submit schemes to the Electricity Commission as it proceeded with its investigation. The expenses of the Committee would be met by a levy on the national sales of electricity through the Electricity Commission.

An Electrical Development Authority

The Electrical Development Authority referred to above would have a constitution similar to that of the Central Electricity Board. It would have powers to finance and assist technical and economic research and the extension of electricity supply to unremunerative areas, and to finance new water-power schemes for public supply and the standardisation of systems.

In it would be vested purchase rights of local authorities, pending the recommendations of the Electricity Commission and it would set up a central testing institution without the approval of which no consumers' appliances would be permitted on distribution mains. It would have powers to act as a central purchasing organisation for the supply industry generally. It should be able to manufacture electrical apparatus where it is proved that development is being retarded by excessive prices for such apparatus.

In addition the Authority would carry out publicity work, taking over the work of existing organisations, and it would also collect statistics (having the power to obtain these from undertakings) bearing upon electrical development. The design and construction of buildings would be subject to the Authority's approval.

Extending the Commissioners' Powers

It is proposed that the powers of the Electricity Commission should be increased to enable them to require any undertaking to equip showrooms, provide facilities for the sale, hire, or hire-purchase of electrical appliances and wiring schemes, or to engage in contracting business. They should be empowered to prescribe model forms of tariffs in the interests of standardisation; to issue Special Orders at the instance of the Investigating Committee to transfer undertakings from one authority to another or to create new distribution authorities to administer amalgamated sections of undertakings; and to vest in the Electrical Development Authority the property and rights under such Special Orders if they are not carried out within a specified time. Pending the report of the Investigating Committee the Commission should prohibit the absorption of local authority undertakings by companies.

It is recommended that a small committee should be appointed at once to prepare a draft Bill for bringing all the electricity supply legislation under one general Act, clarifying and improving where necessary. As to the last, several specific points are mentioned, including the provision of 100 ft. of free service instead of 60 ft.; removing the restriction preventing consumers more than 50 yards from mains from receiving a supply; and leaving the Commissioners to settle the guaranteed return from a consumer and to decide points between undertakings and consumers which are now subject to arbitration.

Removal of Restrictions

Under the heading "Removal of Restrictions and Anomalies" sixteen matters are dealt with; they are briefly as follows:—The prevention of local authorities from debarring any persons from obtaining a supply (including its own tenants) and from refusing to allow supply companies to wire municipal housing estates; the supervision of holding companies by the Electricity Commission; the determination of maximum prices charged by supply companies to limit their dividends (5 per cent. average on existing capital); the revision of legislation governing companies' sliding scales and maximum prices; the allocation of the bulk of local authorities' profits to the reduction of prices; the separation of combined gas and electricity supply companies; and the obtaining of the Electricity Commission's permission to install private plant in excess of 35 kW.

Comparison with McGowan Proposals

Section VII of the report reviews the main proposals of the McGowan Committee (which considered the earlier report of the P.E.P. Electricity Group) and these are compared with the Group's proposals. In the course of this the view that large undertakings are not necessarily more efficient is reiterated. It is considered that the Electricity Commission should remain a purely administrative and judicial body freed from Treasury control. The McGowan proposals regarding power companies are questioned as are the terms for the acquisition of municipal undertakings by private companies. As to extensions in rural areas it is suggested that the local authority should grant direct relief of rates for a limited period.

The last section deals with "The Wider Aspect of Electrical Development." In it are discussed the profound influence of electricity on social progress: its improvement of amenities and health in industry and the home; its aid in the decentralisation of industry; its possibilities in enabling rural industries to be successfully carried on; and its beneficial influence upon the design of industrial buildings.

Appended to the report are thirty-three tables of useful statistics relating to the generation and use of electricity; a list of electricity supply Acts; typical load curves; notes on research and development in rural electrification; brief particulars of the principal associations and institutions in the electrical industry; details of the Joint Electricity Authorities and Boards; and a study of distribution costs.

As a work of reference alone the report is fully worth the amount charged for it.

Correspondence *(Continued from previous page)*

burnt in the house grate and 90 per cent. for a corresponding electric heating equipment, the electric heat available amounts to the equivalent of over 5,000,000 tons of fuel.

I recognise that inasmuch as space heating is not required for about four months in each year the "B" sales will suffer some reduction during this period, but it is fair to assume that during the same period the requirements for water heating will increase. Furthermore, a greater proportion of the energy at present supplied for service "A" is disposed of in the winter months, and to this extent the two services will be mutually self-adjusting.

GEO. WILKINSON.

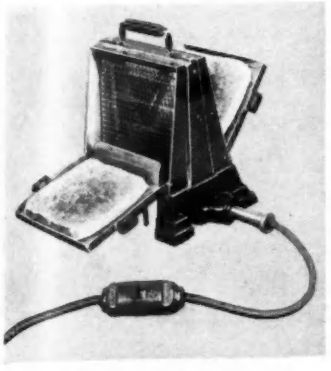
Harrogate, *November 26th.*

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An Electric Toaster

Robust construction and good appearance are features of the new "Pyramid" electric toaster which is being made by HAGUE & MCKENZIE, LTD., Pyramid Works, Sloane Street, Birmingham, 1. The toaster proper is assembled on a moulded base of artistic modern design; the one we examined recently was finished in dark mottled red, but mottled green, black and jazz finishes are also obtainable. The 500-W element is wound on a mica former and protected by a wire guard, while the base of the drop-down metal "doors," which support the toast, is shaped to turn the toast without its being touched. Moulded handles are provided for the "doors" and for carrying, while all the metal parts are heavily chromium-plated. Three yards of three-core braided flex is provided, fitted with an "Anka" connector with a spring earthing clip and a "Lektrik" switch-in-line so that the operation of the toaster may be controlled from the table.



The "Pyramid" toaster

A Mechanical Flayer

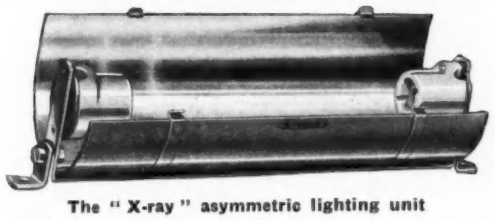
Skins taken off by the "Frudua" flayer are claimed to have a much higher value than those removed by means of knives or other mechanical apparatus. The equipment consists of a 1/16-h.p., 10,000-12,000 r.p.m. universal electric motor, flexible shaft and flaying tool, and it is fitted with a shoulder belt enabling it to be easily carried and operated.

The motor, the frame of which is earthed, is controlled by a switch fitted to the flexible. The tool comprises a gear box and twelve blades fitted uniformly round a carrier disc. Smooth and silent running is ensured by the use of conical gears and ball bearings. When not in use the outfit can be packed away in a small case. The equipment is being marketed in this country by the PIGGOTT ELECTRICAL CO., LTD., Salisbury Square House, London, E.C.4.

The "Frudua" mechanical flayer

Trough Lighting Reflectors

The CURTIS'LIGHTING CO. OF GREAT BRITAIN, LTD., Aldwych House, London, W.C.2, has introduced a range of "X-ray" trough reflectors suitable for the illumination of cornices, laylights, alcoves, windows, showcases, &c. These consist of a metal frame to which is fitted a silvered glass "X-ray" reflector of accurate contour to give a definite light distribution.



The "X-ray" asymmetric lighting unit

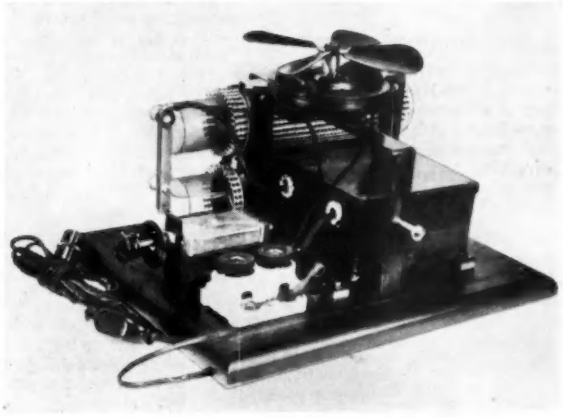
The frame is standard for three types of mirror, which can be interchanged in a few moments. The fixing brackets are adjustable so that the direction of light may be changed. The ends of the units are left open, as the light escaping in this way prevents patchiness.

The units are suitable for two lamps from 25 to 60 W. and are fitted with two back-entry porcelain b.c. lampholders and the standard exterior finish is "silvertone." The type illustrated is the asymmetric unit giving even illumination over a wide area.

The dispersive type is designed for indirect lighting above false ceilings, behind windows and various forms of alcove illumination. For cornices close to the ceiling, the concentrating unit produces a relatively narrow beam. This design is also useful when a long throw is required, as in church and picture gallery lighting.

Electrical Air Conditioning

A recent development in air conditioning by SUNSHINE DEVICES, LTD., 57, Moorfields, Liverpool, 2, are the "Electroaire" portable models "M" and "B." Both are designed on

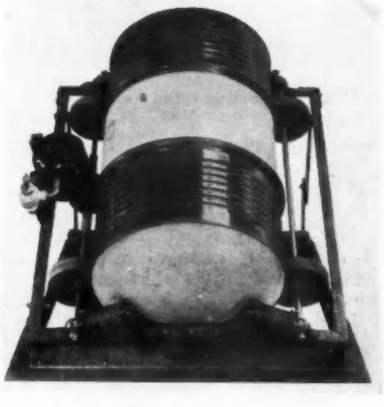


The mechanism of an "Electroaire" air conditioner

ozonising principles, the passage of air through an electric arc generating the necessary ozone. Type "H" is fitted in an aluminium cabinet while type "M" is housed in a wooden cabinet finished in dark walnut. The former measures 6 in. by 8 in. by 12 in., weighs 16 lb., and is rated at 20 W; type "M," designed for use in small offices, stores, restaurants, &c., measures 10 in. by 11 in. by 14 in., weighs 21 lb., and is loaded at 40 W. A vertical fan is provided.

Drum Cleaning

In many industries where powders, liquids or thick mixtures are stored in drums there is loss of material due to inability thoroughly to clean out the contents of such a container. With a newly developed device placed on the market in America it is possible to clean any kind of drum in a very short time. Shafts carrying wheels rest against the sides of the drum and when the ¼-h.p. motor is switched on the drum is rotated thirty times a minute in order to loosen the contents. When the carriage is elevated with the drum attached the ends are cleaned out and the contents may be emptied. Drums may be inserted or removed without stopping the motor. For use in America a 110-V, 60-cycle, single-phase motor is fitted by the makers, the VOL-U-METER CO., INC., 710, Ohio Street, Buffalo, New York, U.S.A.



The drum-cleaning device

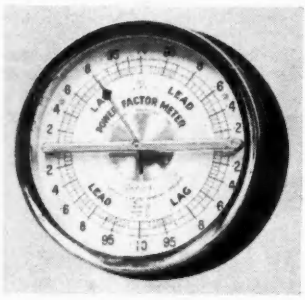
Corrections

We regret that owing to a printer's error the name of the makers of the Mickey-Mouse table lamp shown in last week's issue (page 752) was incorrectly spelt. It should be J. WUIDARTE & Co. On the previous page (751) the capacities of the Belling & Lee condensers should read X 0.1 and Y 0.01 mF, the decimal points having been omitted in last week's issue.

E

Power Factor Meter

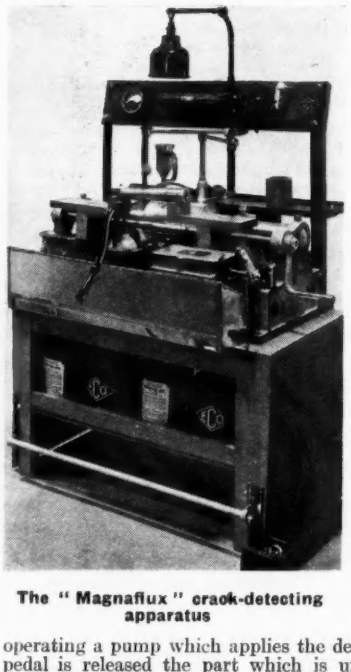
A recently introduced Reyrolle three-phase, balanced load, power factor meter of the moving-iron type with the moving portion free to rotate through 360 deg. can withstand severe short-circuits. A Z-shaped moving iron, energised by a coil connected to the voltage circuit moves in the field of three current coils which are star connected. It takes up a position dependent only on the power factor of the circuit and the direction of the power flow and independent of load current, provided that this is above 20 per cent. of full load. The instrument is said to be unaffected by over-currents of short duration up to fifty times full load; damping is obtained by means of suitable mica vanes moving in air and standard instruments are wound for 110 V, 5 A at 50 cycles. The rating of the voltage coil is 5.5 W and that of each current-coil 1.4.



Reyrolle power factor meter

Except for instruments required for the tropics, the dials are of special paper fixed to metal. For the tropics the dials are of aluminium with a special surface. The scale is divided into four quadrants, marked "lead" and "lag" alternately, the upper half of the scale indicating power flow in the normal direction and the lower half in the reverse direction. The manufacturers of this instrument are A. REYROLLE & CO., LTD., Hebburn-on-Tyne.

Magnetic Crack Detection



The "Magnaflux" crack-detecting apparatus

Crack detection by electricity is not, in itself, a new development, but some improvements have lately been carried out in this type of apparatus made by the EQUIPMENT AND ENGINEERING CO., LTD., 2 & 3, Norfolk Street, London, W.C.2.

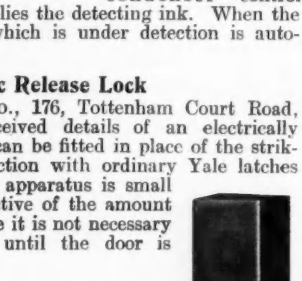
The method used employs a magnetic flux and makes possible much more accurate and rapid crack detection than hitherto. Still greater speed of operation has been achieved by a new model of the "Magnaflux" detector.

The device has been designed for use in a motor-car factory for the testing of chassis, it being only necessary to place the test piece in position on the pole pieces and to depress a pedal, the patent foot switch and condenser control operating a pump which applies the detecting ink. When the pedal is released the part which is under detection is automatically demagnetised.

An Electric Release Lock

From W. C. DAVEY & Co., 176, Tottenham Court Road, London, W.1, we have received details of an electrically operated release lock which can be fitted in place of the striking plate for use in conjunction with ordinary Yale latches or with mortice locks. The apparatus is small and can be operated irrespective of the amount of pressure on the door, while it is not necessary to keep the circuit closed until the door is opened.

By pressing a push-button the door is unlocked immediately. The principle is that the striking plate revolves when released, allowing the catch or bolt to pass it. Normally, the striking plate is prevented from revolving by means of a catch held down by the weight of the solenoid core. When the solenoid is energised the core engages with a small indent, leaving the striking plate free to turn. The indent, which is on the same axis as the striking plate then moves out of the path of the core, so that when the door is shut it returns to its original locking position. The lock will work on a.c. or d.c. supply of from 8 to 12 V so that it can be battery-operated or worked by a transformer on the supply mains.

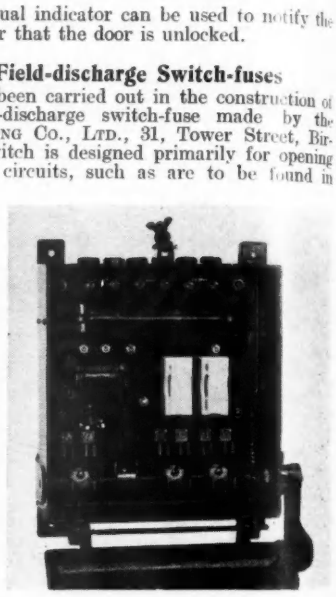


The "Sterdy" release lock

A bell, buzzer or visual indicator can be used to notify the person wishing to enter that the door is unlocked.

Shunt-break Field-discharge Switch-fuses

Improvements have been carried out in the construction of the shunt-break field-discharge switch-fuse made by the CRESSALL MANUFACTURING CO., LTD., 31, Tower Street, Birmingham, 19. The switch is designed primarily for opening and closing inductive circuits, such as are to be found in electro-magnetic separators, magnetic chucks, lifting magnets, relays, magnetic fault detectors, &c., and in the field circuits of dynamos and motors. The non-inductive discharge resistance which is fitted in each switch-fuse is designed to the voltage rise on discharge within the limits specified. Two types of switch are available, the smaller being fitted with a pilot lamp for indicating purposes, while the larger contains a relay for operation from a distance.

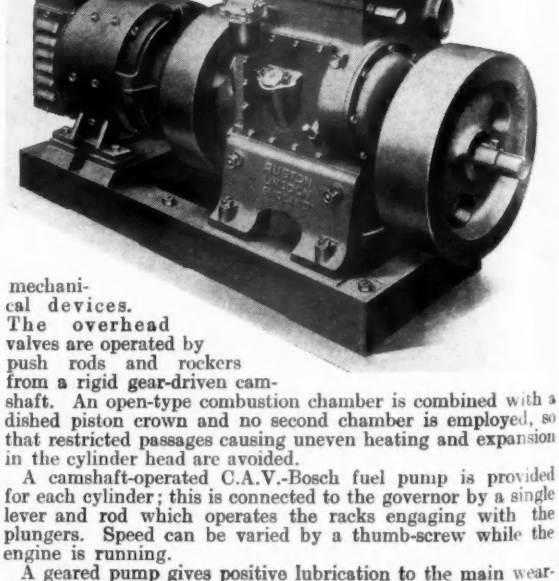


Cressall field-discharge switch-fuse

The cable entries are at the top end of a cast-iron case, an earthing terminal being fixed in the case near the bottom right-hand fixing lug. The panel is of ebony grade Sindanyo mounted on four legs cast integral with the case. Hard rolled copper is used for the switch blades, which are mounted on a removable bakelite covered steel rod; the action is quick-break. The resistance, which is interchangeable, is wound to suit individual requirements on a heat-resisting porcelain bobbin, and finished with a coating of non-hygroscopic insulating enamel. The fuses are rated at 10 A, 250 V.

Small Diesel Engines

A range of small vertical Diesel engines has been designed by RUSTON & HORNSBY, LTD., Lincoln. Two sizes are available, 5 and 7½ b.h.p., and the speed is 1,000 r.p.m. Starting from cold is performed by hand without smouldering fuses or mechanical devices.



Two-cylinder Diesel engine driving an electric generator

The overhead valves are operated by push rods and rockers from a rigid gear-driven camshaft. An open-type combustion chamber is combined with a dished piston crown and no second chamber is employed, so that restricted passages causing uneven heating and expansion in the cylinder head are avoided.

A camshaft-operated C.A.V.-Bosch fuel pump is provided for each cylinder; this is connected to the governor by a single lever and rod which operates the racks engaging with the plungers. Speed can be varied by a thumb-screw while the engine is running.

A geared pump gives positive lubrication to the main wearing parts. Working parts, including fuel pumps, are totally enclosed, but detachable covers render inspection easy, and the bedplate and housing of the engine are cast in one piece to facilitate installation.

The Japanese Electrical Industry

Beneficial effects of systematic planning

THE improvement that has come about since 1932 in the condition of the electricity supply industry in Japan is due to a large extent to rationalisation and systematic planning under Government supervision, as well as to the increased power consumption by the industry, which has also been fostered by the authorities.

In his report to the Department of Overseas Trade on economic and commercial conditions in Japan (Stationery Office, 2s. 6d. net), Sir G. B. Sansom, Commercial Counsellor to H.M. Embassy, Tokyo, states that the total capacity of power plants actually in operation in Japan at the end of 1934 was 5,491,947 kW, of which hydro-electric power stations accounted for 3,268,834 kW, steam power stations for 2,160,757 kW, and internal-combustion power stations for 62,356 kW. The supply companies' share of this capacity was 4,178,331 kW. The total capacity of plants under construction at that date was approximately two million kW. The demand was at that time about five million kW, of which 3.8 million kW was for motive power. The demand is steadily expanding and provision is being made for the further rapid increase in consumption which is expected to result from the growth of industry generally, and from progress in the electrification of railways.

New Generating Plant

Eleven hydro-electric plants were completed in 1935, most of them under 10,000 kW, and fourteen more are reported to be under construction, of which five will be of 50,000 kW capacity or over (the Shinanogawa plant of the Tokyo Electric Light Co., will have a capacity of 156,000 kW). Thermal plants completed in 1935 numbered twenty-seven, and four more are at present under construction. The most important of these are the Kwansai United Thermal Power Co.'s Amagasaki plant (212,000 kW) which was completed in 1935, and the 178,000-kW plant of the Tokyo Electric Light Co., which is under construction at Tsurumi, near Yokohama. The total capital invested in this industry amounted at the end of 1934 to approximately 4,978 million yen. The consumption of electric power rose to 18,794 million kWh, which is equivalent to an annual consumption of about 270 kWh per head.

Under the Electricity Industry Act which came into force in 1932, the Government was given a measure of control over the activities of this industry. Rates, for instance, have been fixed under Government supervision in the various districts served by the numerous supply companies. This degree of control, however, is regarded as inadequate, and during the special session of the Diet in May, 1936, the Minister of Communications disclosed his intention of instituting more rigid Government control, with a view to eventual nationalisation of the industry. Under a law promulgated in May, a semi-official company, to be known as the Tohoku Development Electric Power Co., Ltd., is to be established with a capital of 30 million yen for the industrial development of the poor north-eastern district of the main island. The new company will be virtually a State enterprise, and its establishment provides one more instance of the tendency in this industry towards more direct control by the State.

Imports and Exports

Dealing with the electrical trade the report states that there is a fair but variable import of Diesel engines, in particular for use in power plants. Imports of internal-combustion engines reached their height in 1933, the total value of those from the United Kingdom amounting to 1,887,000 yen. The value in 1934 declined to 388,000 yen.

The following table shows the values of imported electrical and allied machinery and machine tools for 1934, 1935, and the first half of the current year.

	Import values in 1,000 yen		
	1934	1935	1936 (6 Months)
Steam boilers and parts and accessories thereof	4,091	6,110	2,620
Internal-combustion engines :—			
Under 250 kg.	3,253	344	406
Under 2,500 kg.	17,277	14,801	7,669
Other...	248	414	361
Dynamos and electric motors :—			
Under 100 kg.	829	1,044	414
Under 5,000 kg.	146	209	73
Other...	248	1,004	599
Steam turbines	430	804	704
Fuel economisers...	393	733	162
Electrical measuring instruments	1,607	2,382	1,313
Telephonic instruments...	1,358	966	566

Exports of machinery and parts registered a further increase in 1935 when they reached a total of 64 million yen. The principal types reported are textile machinery and electrical machinery.

There is an extensive export trade in "lamps and parts thereof," which include electric light bulbs and glass electric light shades. The value of exports under this head averages about 16 million yen over the past three years.

Until recently Japan has depended entirely on imported supplies of aluminium, but by the end of 1935 two companies were producing a certain amount of this metal, and three or four factories were either under construction or being planned. The Japanese companies actually engaged in manufacture are the Japan Electrical Industries Co., Ltd., with an output of ten metric tons a day, and the Japan-Manchuria (Nichiman) Aluminium Co., Ltd.

Radio Progress

Considerable development has taken place in the radio trade during the past two years. Formerly the business was in the hands of small concerns, but larger capitalists have recently become interested and are going into the manufacture on a bigger scale, gradually driving out the small makers. The largest and most active is the Tokyo Electric Co., Ltd., which is gradually absorbing the smaller factories and producing quantities of valves and sets, and various radio products, both for domestic use and export. There are two or three other large concerns which are also competing, and it is expected that these will practically control the industry. As a consequence of this development the importation of wireless sets and parts has now all but ceased, only a few receivers, which include short-wave reception, being brought in from the United States. There are thirty-one broadcasting stations now established in Japan. The Tokyo Central Station is expected to broadcast on 150 kW from the spring of 1937, and a station in Kyushu will probably increase its power to the same extent. The present number of radio subscribers is about 3,000,000. Television is still in the experimental stage in Japan, and is not likely to be of importance for some years to come.

The length of electrified railways at the end of November, 1935, was 6,519 km., of which 582 km. were Government railways and 5,937 km. privately owned.

Parliamentary News (BY OUR SPECIAL REPORTER)

IN the House of Commons on November 25th Mr. R. Taylor, a Labour member, called attention to the need for the reorganisation of the electricity supply industry, and moved :—

"That this House, believing that the national ownership and control of the electricity supply industry is an essential step in a programme of nationally planned economic development, is of opinion that electricity generation and distribution should be brought under national ownership and control and that there should be established a national electricity authority responsible for securing the efficient direction and management of the industry, subject to such ministerial and other direction as may be provided for by statute."

He urged the need for nationalisation, and declared that private companies were hanging on to the industry "like limpets." Instead of coal being brought from Northumberland and other coal areas to London for the purpose of generating electricity it would be far better to generate the current in the coal areas and distribute it to the consumer by means of high-voltage mains. At present the prices charged for electricity were in a chaotic condition. Mr. Ridley, who seconded, said that the Central Electricity Board was still completely unable to deal with the distribution side of the industry. Unification would result in the standardisation of voltages and equipment, and would simplify tariffs and prices.

Mr. H. Williams, from the Government benches, moved the following amendment :—

"That this House, believing that the national ownership of electrical distribution is contained in the report of the Committee on this subject, and expresses the hope that as soon as Parliamentary time is available the Government will introduce a Bill based on this report."

He asked if there was any industry that had made more progress during the last fifteen years or had increased its number of customers more rapidly. Or whether there was any industry which had been more hampered by legislation. The average price charged for electricity during the last ten years had been reduced by one-half, and the number of consumers was four times as great. That was very remarkable for an industry which had been described as chaotic.

The central idea of the McGowan Committee was thoroughly sound. It was the idea that they had an existing situation which was the best basis on which to build up a better situation, and, for the comfort of those who thought that ultimately it should be under some form of national control, it was sug-

gested that in fifty years' time, or thereabouts, the whole situation should once again be reviewed.

Sir A. Gridley seconded the amendment, and pointed out that under present conditions electricity was available cheaply to industry. The generating system was as perfect as it could be, though he agreed that in connection with distribution the movers of the motion were on firmer ground. There was room for reform, but the motion suggested nationalisation, for which no case had been made out. Those connected with the industry were experiencing from the gas industry competition which was more fierce—he would not say more unscrupulous, but certainly much more vigorous than they had experienced for many years past. Would they leave that active, vigorous industry to continue to compete with a nationalised electricity supply?

Mr. Herbert Morrison argued strongly for nationalisation, and begged the Minister not to waste his time on the McGowan Report. The Labour Party maintained that the whole of the existing undertakings should be abolished, together with the Central Electricity Board and the Electricity Commissioners, to give place to a National Corporation, a business concern, to be appointed by the Minister on grounds of competence and ability, to run the industry. Regional Boards should be set up, and they should be subject to the policy of the National Board, and each should have a first-class electrical engineer and a first-class sales manager.

Replying to the debate, Mr. Hore-Belisha, Minister of Transport, urged members to wait till the McGowan Report had been thoroughly considered by the Government, who would produce a comprehensive plan—not a piecemeal one. He pointed out that since the Electricity Act of 1926 was passed 100 superfluous stations had been eliminated, interconnection had been effected, and all distributing centres in the country could now depend on their requirements being met directly or indirectly through the mains of the Central Board, and by next year a single frequency would prevail. Previous to these reforms the reserve plant in the generating stations, representing many millions of invested money, was 83 per cent. in excess of the aggregate demands upon it. To-day, although the process was not yet completed, it had been possible, by pooling all resources, to reduce this reserve to not more than 40 per cent. In the result the cost of a unit of electricity delivered wholesale through the medium of the Board now averaged less than ½d., whereas ten years ago it was 1d. Such benefits as had been secured had been secured with the good will and largely at the cost of the industry itself. The organisation which was doing this work was, by the terms of the motion, to be expropriated and swept away. The £50,000,000 borrowed by the Board would have to be acquired by the State and all the capital invested in the generating stations, amounting to £147,000,000, would have to be transferred. The Board itself, now uninfluenced except by commercial principles, would have to be absorbed into some Government Department. In conclusion, Mr. Hore-Belisha said: "We shall produce our measure as a comprehensive whole when it has been discussed and considered by the industry. In advance of that I am not prepared to say more than I have done."

After Mr. de Rothschild had emphasised the need for the development of electricity in rural areas, the amendment was carried by 173 votes to 114.

Supply in Rural Areas

On November 26th Mr. Smedley Crooke asked the Minister of Transport if, in view of the prevailing need of the farming industry for electricity for lighting and power, he would take the necessary steps with the power companies to accelerate the supply to farmers.

Mr. Hore-Belisha said that electricity supply undertakers were constantly extending their mains into the rural areas. If Mr. Crooke had in view any particular cases he would be pleased to look into the possibility of expediting development.

South Wales Tariff

Mr. Jenkins asked the Minister of Transport on November 26th whether he could state the cost per unit for electricity to householders in the districts supplied in the area of the South Wales Power Co.

Mr. Hore-Belisha gave details of the company's charges and said that the average revenue per unit sold for lighting, heating and cooking appeared last year to have been 3.28d.

Radio Relay Systems

On November 30th Captain Plugge asked the Postmaster-General what was the present approximate revenue of the Post Office for wireless licences issued in respect of receiving apparatus connected with wireless exchanges in this country.

Major Tryon said that the total revenue from wireless licences issued in respect of receiving apparatus connected with wireless exchanges in this country was about £117,830 a year. Ten per cent. of the licence revenue was retained by the Post Office.

Interference with Broadcast Reception

Mr. Storey asked the Postmaster-General what steps his department took in order to compel the owners of electrical plant which interfered with the reception of broadcast programmes by receiving stations in the neighbourhood to install suppression apparatus.

Major Tryon said that he had no statutory power to compel owners of electrical plant which caused interference with broadcast reception to install suppression apparatus, although in such cases efforts were made by his department to discover a remedy and to persuade the persons concerned to avail themselves of it. A committee appointed by the Institution of Electrical Engineers had recently investigated the subject and had recommended that statutory powers should be sought. The Committee's recommendations were at present under consideration.

In the Courts

An Unearthed Drill

At Airdrie Sheriff Court on November 23rd Robert Borland, poultry house builder, Airdrie, was charged with having had a portable electric drill insufficiently earthed for alternating current, in consequence of which neglect an employé received on electric shock through the conducting floor on which he was standing, and died. A fellow employé said that he found deceased lying on his side and received a shock on bending down to lift him. Witness, realising what was wrong, switched off the current. Other witnesses stated that respondent had told them that if there were any defects in any of the electrical apparatus it was to be reported immediately.

Mr. Andrew Finlay, electrical engineer, Airdrie, gave evidence relating to an examination of the drill after the accident. He found the adapter broken and the machine had not been earthed. Workmen in the factory, for the defence, said the drill had always been in satisfactory working order. On the day of the accident deceased had entered the workshop, asked for a knife, and was seen doing something to the drill plug with a screwdriver. Respondent said he had seven or eight machines operated by electricity. When he purchased the drill in question it had a three-core cable and had been in almost constant use since 1934. He had instructed his employés not to interfere with any apparatus. He had been told that the authorities advised a three-pin plug, but not that they insisted upon one. He had received no complaints from deceased regarding the drill. The Sheriff found the charge proved and imposed a fine of £5.

Alleged Fraud Case Fails

Judgment was given recently by Lord Robertson in an action at the Court of Session in which Andrew R. Muir, Newlands, Glasgow, sued George B. Burnside, Dullatur, and William B. Hutchison, Cambuslang, for payment of £4,375. His Lordship said that the action was one for damages, based on alleged fraud. Three sums of £1,000, £3,000 and £375 were paid by the plaintiff to a company called Thermovent, Ltd., against the issue at par of shares of that company to him as regarded the first two items, and to his nominee as regarded the third item. Those shares were in fact allotted to the plaintiff and his nominee in 1934, and they continued to be held by them, but the company went into liquidation on December 31st, 1935. The action was raised in July, 1934, while the company was still carrying on its business. The claim of the plaintiff was not directed against the company and was not for rescission of the contract or contracts to take shares. It was for damages, and was directed against the two defendants jointly and severally. They were both directors of the company but were sued in their individual capacities. The claim against them was based on allegations of damage occasioned by alleged false and fraudulent representations; by an alleged fraudulent scheme; and by alleged non-disclosure of material facts which it was said they had a duty to disclose to the plaintiff.

His Lordship decided that the plaintiff had failed to prove the fraud upon which his action was based, and in his Lordship's view no such fraud was practised. He accordingly gave judgment for the defendants.

Radio Patent Infringement

In the Chancery Division last week Mr. Justice Luxmoore had before him the case of Marconi's Wireless Telegraph Co., Ltd., against Ems-Harris (trading as the Colonial Radio Co.) upon a motion by the plaintiff company for judgment in default of defence. Mr. Tookey, in support of the motion, said that the action was brought by the plaintiffs against the defendants for an alleged infringement of the plaintiffs' letters patent for a circuit arrangement for tuning in wireless receiving sets.

His Lordship made the order for judgment asked for, including an order on the defendants for the destruction or the rendering unfit for use all articles and things in their custody or control which were an infringement of the plaintiffs' patent.

Ayrshire Electricity Board Fined

At the Kilmarnock Sheriff Court on November 27th the Ayrshire Electricity Board was charged with an infringement of the Factory and Workshops Act in that the Board had

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

An Electro-medical Trade Association

Electro-Medical Trade Association, Ltd., was registered on November 25th as a company limited by guarantee without share capital. The objects are to encourage, promote and protect the electro-medical industry and to watch over and protect the general interests of companies, firms or persons engaged in the manufacture or distribution of all apparatus for physical medicine but independently of the personal interests of any company, firm or person. The management is vested in a council, the first officers being Messrs. W. D. McGillivray (chairman), F. W. Read (vice-chairman), C. H. Greenham (hon. treasurer), and E. H. Willis (hon. secretary). The directors are: Cox-Cavendish Electrical Co. (1924), Ltd.; Electro-Medical Supplies (Greenham), Ltd.; Schall & Son, Ltd.; Stanley Cox, Ltd.; Watson & Sons (Electro-Medical), Ltd.; F. W. Read & Sons, Ltd.; and Hanovia, Ltd. The registered office is at 2, Savoy Hill, Strand, W.C.2.

Chinese Contracts for Britain

A *Reuter* message from Canton states that contracts involving sums of approximately £136,000 and £200,000 were signed recently by the Mayor of Canton and representatives of Malcolm & Co. and the General Electric Co., Ltd. The contracts are respectively for the extensive improvement of the Canton waterworks and the provision of sixty-four Leyland trolley-buses.

Irish Free State Electrical Imports

An unusually active state of affairs prevailed in the electrical industry in the Irish Free State during October, the month's imports of electrical machinery and allied material attaining a value of £153,983, as compared with £110,525 in the corresponding month of 1935. The aggregate imports during the first ten months of the current year, as will be seen from the appended table, amounted to £909,675, or an increase of £77,342 over the similar period of 1935. Eight of the twelve items have shared in the increase:

	JAN.–OCT. 1935.	1936.
	£	£
Electric motors	38,513	45,003
Other electrical machinery	165,166	184,258
Dry batteries and parts	27,532	16,711
Electric lamp bulbs	57,568	43,868
Electric lighting accessories, fittings and parts	65,882	66,233
Electric wires and cables, insulated	78,383	86,475
Telephone and telegraph material	12,578	32,105
Radio receivers, complete	86,692	82,314
Radio-gramophones, complete	5,220	2,280
Other radio apparatus, fully or partly assembled	5,126	7,681
Radio parts and accessories	65,950	89,946
Other electrical goods and apparatus	223,723	252,791
Total	£832,333	£909,675

Price Increases

The Donovan Electrical Co., Ltd., announces that owing to the increased cost of raw materials and labour, the prices of "Safuse" and "Donlok" switches, fusegear, and manual and automatic control gear, as given in current catalogues, and outstanding quotations given before November 28th, have been increased by 5 per cent. as from December 1st.

Wm. Sanders & Co. (Wednesbury), Ltd., inform us that, owing to the increase in raw material and labour costs, the price of their iron-clad switch and fusegear has been increased by 5 per cent. This increase does not apply to the prices of safety sockets and plugs listed in Catalogue 124, which remain unchanged.

Orders Recently Booked

The D.P. Battery Co., Ltd., has received orders for locomotive batteries from the General Electric Co., Ltd., and Metropolitan-Vickers Electrical Co., Ltd. The nine locomotives for which these batteries are ordered will be used by the London Passenger Transport Board in connection with extensions now in progress on the Underground railway system. The batteries are each of 768 Ah capacity and 320 V, and comprise cells of the latest D.P. Kathanode locomotive type. This order follows the successful use of three similar batteries on this work during the past five years.

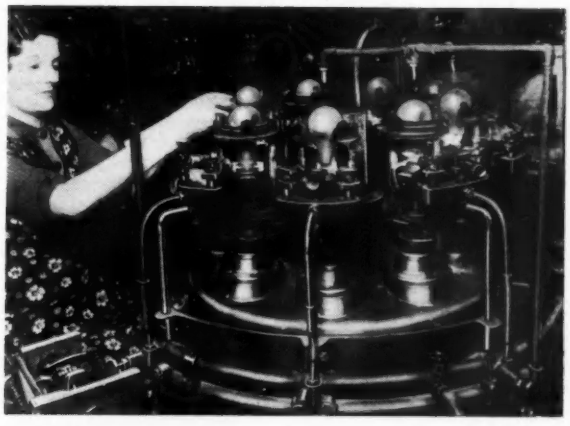
The English Electric Co., Ltd., has received an order for forty-nine luxury coach bodies from the Birmingham and Midland Motor Omnibus Co., Ltd., which is additional to an order for sixty-five single-deck omnibus bodies at present under construction for the same company.

Industrial Welfare

The Duke of York will preside at the dinner of the Industrial Welfare Society, which will be held at the Hotel Victoria, Northumberland Avenue, W.C., on December 9th.

Lamp Factory Extensions at Edmonton

As the factory taken over by Atlas Lamp Works, Ltd., at the Angel Factory Colony, Edmonton, three years ago has already proved too small for its purpose, an extension has just been completed which will enable production to be increased by at least 50 per cent. Initially the new building will be utilised for storage purposes, thus permitting the whole of the ground floor of the main building to be used for final manufacturing processes, including ageing, testing, cleaning, framing and packing. The first floor will then be devoted entirely to the initial manufacturing stages, such as stem-making, inserting, sealing, exhausting, and so on. At the moment the range of lamps manufactured at the works covers all domestic types, both gasfilled and vacuum, tubular lamps, traction lamps, &c., but the additional accommodation now available will make it possible for the company to extend its activities to include the production of automobile lamps. Ultimately it is proposed to extend the new section of the factory (which is 100 ft. long) a further 150 ft. and to transfer production to the new building, converting the original factory into stores, &c. To facilitate loading and despatch a roadway has been constructed between the two sections of the factory. At present there are about a hundred employés, but this number will be increased when the reorganisation has been completed.



A capping machine in operation at the Atlas Lamp Works, Edmonton

In the Courts *(Continued from previous page)*

failed to see that certain switchgear at Kilbirnie was made "dead" while an employé was working upon it. As a consequence the man, Robert Marshall, received injuries from which he subsequently died.

It was stated in evidence that the isolating switch connected with the gear in question had been locked back when Marshall commenced his work but was accidentally closed before he had finished, and he received a shock which caused him to fall from a tower. It was maintained for the Board that every possible precaution had been taken; the man in charge of the work was quite competent; and that the case could be dealt with by an admonition.

The Sheriff stated that he agreed to a great extent with what had been said for the Board and considered that justice would be met by the imposition of the nominal penalty of £5.

An Installation Fraud

Leonard Willis, Chesterfield, was at the Derbyshire Assizes last week sentenced to six months in the second division for obtaining sums amounting to about £45 by fraud. It was alleged that the accused called on various persons, introducing himself as a representative of the Derbyshire and Notts Electric Power Co., seeking orders for electric lighting installations. He quoted prices for installation and electricity, promised that power would be available by certain dates, and said the price included everything for supply. Customers gave orders and found that the wiring was done by a Mansfield firm, and that on completion they had further sums to pay and that the power company required a much higher price for electricity than defendant had quoted.

Accused, who denied that he said he represented the power company, stated that from May to December he represented the Notts and Derby Supply Area Electrical Circle, which was composed of electrical contractors.

Mr. Justice Atkinson, in inflicting the sentence of imprisonment, expressed the view that it was an extremely clever fraud, and that the accused was not the only one to blame.

Mr. A. Deutsch, a director of the company, tells us that since instituting a bonus scheme, which has resulted in the average wages being raised by about 10 per cent., output has shown a marked increase, with a considerable improvement in efficiency. Except during rush periods a five-day week is worked.

Indian Electrical Imports

The returns of seaborne trade of India during the first half of the current fiscal year (April to September) show that the imports of electrical machinery into India during the period amounted in value to Rs.115 lakhs as against Rs.93 lakhs in the corresponding period of the previous year. Imports from the United Kingdom improved from Rs.61 lakhs to Rs.81 lakhs, and imports from Germany rose from Rs.12 lakhs to Rs.16 lakhs. Imports of electrical goods rose from Rs.136 lakhs to Rs.138 lakhs, and the share of the United Kingdom rose from Rs.72 lakhs to Rs.77 lakhs. Germany's share also increased from Rs.15 lakhs to Rs.19 lakhs. Imports of wires and cables increased from Rs.35 lakhs to Rs.42 lakhs, and of wireless apparatus from Rs.11 lakhs to Rs.13 lakhs, the United Kingdom's share of the latter falling slightly to Rs.5 lakhs, while those from the United States rose from Rs.4 lakhs to Rs.6 lakhs.

The Crystal Palace Fire

At the time of going to press the cause of the disastrous fire which destroyed the greater part of the Crystal Palace last Monday has not been ascertained. It is interesting to learn from the General Electric Co., Ltd., however, that throughout the fire the "Osira" lamps in G.E.C. bowl refractor lanterns recently installed by the County of London Electric Supply Co., Ltd., on the Crystal Palace Parade remained switched on, and after the fire they were found to be in perfect working order despite the intense heat, falling débris and water to which they were subjected.

The "Variostat"

In dealing with the heating system at the new County Offices, Chichester (ELECTRICAL REVIEW, November 20th, page 702), we referred to the variostat control. This was supplied by the Drayton Regulator & Instrument Co., Ltd., who inform us that "Variostat" is a registered trade name.

Social Events

The annual dinner of Standard Switchgear, Ltd., was held on November 27th at the White Hart Hotel, Brentwood, when Mr. A. G. Collis, governing director, said that the company's progress this year had been very marked and its scope enlarged by the erection of cupolas and foundry for the production of various metals forming part of the finished products, by the erection of a works for the manufacture of meters, the completion of the social club and canteen, and by the addition of a plating shop and other auxiliaries. The orders for switchgear continued to increase, and this year they were 50 per cent. in excess of last year. Their export trade was increasing, and orders had been booked for a considerable time ahead.

The South Hants Electrical Industries Golfing Society recently held its annual meeting under the chairmanship of the captain of the Club, Mr. W. A. Maddick. A vote of thanks was passed to the secretary for his services during the preceding year. The annual supper followed, and the retiring captain, Mr. W. A. Maddick, welcomed to the chair the new captain, Mr. A. B. Burgess. As on previous occasions, the society had the pleasure of the company of several friends from Brighton and district. Mr. A. E. Hadley welcomed the visitors, and Mr. Murgatroyd responded suitably.

New B.E.N. Offices

The accompanying illustration shows the imposing new frontage which has been added to the works of B.E.N. Patents, Ltd., Park Royal, N.W.10. Apart from the additional office accommodation gained by this two-floor office block, valuable floor space has been freed for production purposes. The elevation is rendered in cement with a special white finish applied with B.E.N. sprayers. The unusual combination of black faience panels with the red tile door surrounds provides a pleasing contrast to the predominating whiteness. This addition was carried out without interference to ordinary works routine.

The new offices of B.E.N. Patents, Ltd.

United States Electrical Machinery Exports

Official figures just to hand show that the exports of electrical machinery and apparatus from the United States during the eight months ended with August last attained a value of roundly £11,740,000, as compared with £9,840,000 in the corresponding eight months of 1935, an increase of 19.3 per cent.

Cheap Electricity for New Westminster Flats

As an inducement to tenants of the new Dolphin Square flats, London, S.W.1, to make their homes all-electric, an arrangement has been reached between the owners, Richard Costain, Ltd., and the Westminster Electric Supply Corporation, Ltd., to provide electricity at ½d. per kWh, instead of 1d. as in the other flats. A choice is given between a "90 J" or "91 J" Jackson cooker (each with 4-pt. Bulpitt kettle) and an "F32" or "F3" H.M.V. refrigerator, and this apparatus is covered by an annual maintenance charge of £2. Although central heating is provided a 2-kW Belling inset fire is a standard fitting in the living room, which has an extra plug point for vacuum cleaner, radio, etc. There are both heating and lighting points in the bedrooms and all the bathrooms have a light over the mirror as well as a central fitting. A 4-programme radio relay service (provided by Radio Furniture & Fittings, Ltd.) is available. So far about 600 flats (with rents from £75 to £465 per annum) have been erected, but when completed, Dolphin Square, which will have cost about £1,500,000, will comprise 1,250 self-contained residences and will, it is claimed, be the largest block of flats in Europe. Until a few months ago the old Army clothing store stood on the site in Grosvenor Road, Westminster. Among the amenities of the completed building will be a swimming bath, gymnasium, nursery, restaurant, and underground car park. The electrical contractors are Drake & Gorham, Ltd.

[Elec. Rev. photos.

Two examples of Christmas illuminations showing (left) a Noah's Ark design at Wickhams (C. Barker), Ltd., and (right) Thomas Wallis & Co., Ltd., Holborn

Local Exhibitions

Opening an exhibition of modern electrical appliances organised by the Cannock Electricity Department at Hednesford last week, Mr. S. T. Allen, manager of the Central England area of the Central Electricity Board, expressed satisfaction that it was realised in Cannock that an electricity supply undertaking was a public utility concern in its fullest sense. He recalled that it was fourteen years since, as engineer to the

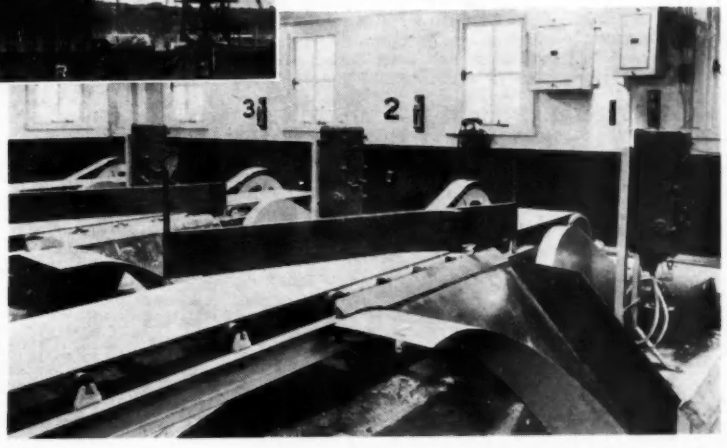
Wolverhampton Electricity Department, he took a part in building up the Cannock undertaking, and mentioned that since that time enormous improvements had been made, particularly in domestic apparatus. In the absence of Mr. M. Wright (chairman of the Cannock Electricity Committee) Mr. T. Whitehouse, vice-chairman, presided. He said that the number of consumers supplied by the department had increased since 1930 from 2,500 at the rate of 1,000 a year up to 8,500. In the same period the number of kWh consumed per annum had risen from five to ten millions, and the yearly revenue had grown from £32,000 to over £60,000. The undertaking now served an area of 43 sq. miles and supplied 12,300 premises.

Supply Company's New Premises

In the new premises of the Urban Electric Supply Co., Ltd., in High Street, Grantham, the offices each have their own schemes of decoration. There is a large showroom with ample window space for effective displays. The showroom itself, which is 25 ft. by 20 ft., is oak panelled 7 ft. high, and has an oak block floor. On the floor above there is room for the display of shades and cooking and water-heating apparatus.

Nine Elms Warehouse

Electrically operated plant has reduced the handling of goods to the minimum at the Southern Railway Company's new six-storey warehouse for grain and general goods which has just been completed on the riverside at Nine Elms, London. Goods arriving by river are lifted by one of the six 5-ton Stothert & Pitt mobile wharf cranes and placed either on the ground floor platform or directly on to an upper floor by means of loop-hole doors. Grain in bags is received on the ground floor whence it is taken by one of six vertical sack elevators (Spencer (Melksham) Ltd.) to any floor above. These elevators, which are each driven by a 10-b.h.p. Crompton Parkinson motor and are controlled from the machinery room by Brookhirst starters, have a maximum capacity of 380 bags an hour; a "Tangent" alarm bell system gives warning when they are about to be operated. When the grain is required to be taken to another portion of the building not immediately above the reception point, the bags are carried up the elevator and discharged on to one of three 150 ft. per min. reversible band conveyors (each operated by a 6-b.h.p. Crompton Parkinson motor with Brookhirst starter) on the sixth floor. These take it to one of twelve spiral chutes, which discharge to any floor in any part of the building. Four of the chutes are twin so as to enable grain to be discharged on either side of trucks standing in the sidings which come into the building. For goods which are unsuitable or too bulky for the conveyors three 2-ton Express lifts are provided. The lighting of the building is particularly good, and comes from 908 Benjamin fittings with 150-W lamps. The position and size of the warehouse (it is 310 ft. long by 80 ft. wide by 100 ft. high) make it particularly suitable for floodlighting, and when the installation is switched on in a few days' time the night effect from across the river should be very striking: the ninety-nine floodlights used were supplied by the General Electric Co., Ltd. Other electrical features of the building include Siemens intercommunication telephones and Gambrells, Rowse and Snoaden fire-alarm systems. The electrical contractors were Drake & Gorham, Ltd.



The Southern Railway Co.'s new Nine Elms warehouse, showing band conveyors operated by 6-b.h.p. Crompton Parkinson motors

[*Elec. Rev.* photo

Trade Announcements

Mr. C. E. Pryke, electrical contractor, has opened showrooms at 56, East Street, Faversham.

George Green & Co. are moving to new factory and office premises at 18, Camden Street, Birmingham.

Mr. F. E. Dickinson has removed to 40-41, Furnival Street, E.C.4 (telephone: Holborn 9369).

R. H. Clampett & Co., Ltd., have removed to 10, Paton Street, Piccadilly, Manchester.

Rex Meters, Ltd., has erected a new factory at Kingsbury Works, The Hyde, Hendon, N.W. (telephone: Col. 7107), to take over the manufacture and sale of "Rex" meters.

Teesmade, Ltd., has opened new showrooms at 82, St. Mary's Road, South Ealing, W.5.

Mackay & Partners, Ltd., inform us that they have acquired the rights of the "Waring" electric tubular heater and other "Waring" electrical products, from the Waring Tube Heating Co., Ltd.

A Shop Lighting Booklet

We have received from the Birmingham Corporation Electric Supply Department a copy of a booklet which it is distributing to all shopkeepers in its area of supply. This draws attention to the reduced rate of 1½d. per kWh for the lighting of shop windows after the normal closing hour (1¾d. in the Warwickshire area), and contains suggestions for shop-lighting schemes for particular trades, with recommended intensities for different areas of the city. With the booklet a leaflet is being issued announcing a special rate of 1d. per kWh, for electricity supplied for approved special illumination decorations during the period of the Coronation festivities.

The B.I.F.

European visitors to the British Industries Fair will be able to secure reductions in the cost of their fares. Twenty-two European railway administrations offer reductions of from 10 per cent. to 50 per cent. for return tickets to London.

British railway companies offer return tickets to London or Birmingham, at a reduction of about a third of the price, from the Hook of Holland, Rotterdam, Flushing, Antwerp, Ostend, Calais, Boulogne, Dieppe, Dunkerque, Havre and St. Malo. Return tickets at substantial reductions will be issued by many of the principal shipping companies serving the Scandinavian and Northern European routes to England. Imperial Airways, Ltd., British Airways, Ltd., and British Continental Airways, Ltd., and the chief European airways services offer single or return tickets at a reduction of 10 per cent. Full information regarding these concessions can be obtained from the chief European travel agencies, and vouchers entitling visitors to them are to be obtained from the nearest British Embassy or Consulate.

A Floodlighted Office Building

Referring to the photograph of the floodlighted exterior of the Eagle, Star & British Dominions Insurance Co.'s head office in Threadneedle Street, London, which appeared in our October 16th issue (page 544), Floodlighting & Fittings, Ltd., tell us that for the 7,200 sq. ft. of main frontage shown twelve of their model "D" focusing floodlights (with 500 or 1,000 W lamps) and eight model "B" units (with 300 or 500 W lamps) were employed. We are informed that these floodlights have a total loading of 11 kW or approximately 1½ W per sq. ft.

The King to Visit Revo Works

The Revo Electric Co., Ltd., informs us that His Majesty the King is to visit the company's works at Tipton, Staffs, on Wednesday next.

Uruguayan Duties on Imported Cable

H.M. Consul at Montevideo reports that, in accordance with a resolution dated October 14th, the Customs duties on imported electric wires and cables, &c., have been increased from 31 per cent. to 48 per cent., plus the usual additional duties in each case. These rates of duty are levied on the corresponding Customs valuations which the *Board of Trade Journal* states are as follows:—Wires and cables of copper or tinned copper, covered, in general (0.50 pesos per gross kg.); wires and cables of copper, or varnished or enamelled copper,

with or without covering of cotton, for drums (0.55 pesos per gross kg.); wires and cables, of copper or tinned copper, covered with cotton and treated with paraffin wax (0.65 pesos per gross kg.); wires and cables of copper or tinned copper, covered in silk and the like (2 pesos per kg.); wires or cords, flexible, of copper or tinned copper, covered, in general (0.80 pesos per gross kg.); the same covered in silk and the like (2 pesos per kg.); wires and cables, flexible, of copper or tinned copper, with exterior covering of rubber or the like (0.90 pesos per kg.).

Radio Window Displays

The accompanying illustration shows a window display which Ferranti, Ltd., is installing on the premises of Ferranti registered dealers. The company's special window display programme is now in full swing and while it is anticipated that

A Ferranti radio window display

displays will continue to be made on the same lines well into the New Year, special festive modifications have been included to link up with the Christmas season.

German Electrical Exports

There was an increase of 12 million Rm. in the value of Germany's electrical exports during the first half of the current year as compared with the corresponding period of 1935, states *Elektrotechnische Zeitschrift*. The accompanying figures show the totals of the principal groups with a note of increases or decreases. The advance has been spread over most sections of the trade, that in dynamos and motors of the smaller capacities being outstanding. The leading markets for this plant were Sweden, Belgium, India, Argentina and Turkey. In the larger capacities Sweden, India and Argentina also figured as well as Brazil and China. While, generally speaking, Germany's best customers for her electrical goods are countries on the Continent, particularly Holland and Belgium, she has been receiving noteworthy orders for telephone material for China, cable for South Africa, Argentina and India, and batteries for India and the United Kingdom. Another outstanding item is a large consignment of measuring and recording instruments for Russia.

	Jan.–June, 1936. Rm. (000).	Inc. or dec. Jan.–June, 1935. Rm. (000).
Lighting and starting apparatus for motor vehicles	1,447	– 33
Dynamos, motors, convertors and transformers up to 5 double centner	8,100	+ 1,540
Dynamos, motors, convertors and transformers, from 5 to 30 double centner	2,350	+ 215
Dynamos, motors, convertors and transformers, over 30 double centner	2,020	+ 40
Armatures and commutators	1,350	+ 190
Cable	5,840	+ 770
Accumulators, plates, &c.	1,240	+ 55
Electric irons	360	+ 20
Heating and cooking apparatus	3,210	+ 180
Galvanic batteries and parts, and heating elements	840	+ 200
Measuring and recording instruments	9,360	+ 65
Metal filament lamps	3,750	– 260
Telephone material	6,920	– 720
Wireless material	11,010	+ 1,710
Safety and signalling apparatus	2,900	+ 1,160
Ignition apparatus, &c., and parts (excluding magnetos) and electrical accessories for motor vehicles	5,350	+ 730
Apparatus for lighting, power transmission, electrolysis, resistances, &c.	27,070	+ 4,700
Telegraph or telephone insulators	750	– 90
Electro-medical and dental apparatus	6,110	+ 90

Electrical Development in Denmark

Considerable success has been achieved by the Danish engineering industry in the manufacture of dairy and cement-making machinery, vacuum cleaners, Diesel engines, electric motors, &c. Close co-operation between concerns whose products supplement one another has led to many important contracts being secured. Mr. E. G. Cable (commercial secretary to H.M. Legation at Copenhagen), in his report to the Department of Overseas Trade on the economic and commercial conditions in Denmark (Stationery Office, 1s. 6d. net), states that there was an increase in the production of machinery, especially electrical, during 1935, and that this was maintained in the first six months of the current year. Exports of refrigerating plant and electrical machinery increased by over 50 per cent., and orders were received from the North Spanish railways for six electric motors for locomotives and from the Belgian State railway for two 12-cylinder 400 h.p. Diesel motors for locomotives. Denmark supplied the United Kingdom with machinery, including dynamos and motors, Diesel engines and dairy machinery, to the value of 4.8 million kroner, while the upward trend in the value of United Kingdom exports to Denmark was maintained throughout 1935 and the first six months of 1936. The returns of the State railways show steady improvement, a large share of the success being due to the electrification of Copenhagen suburban traffic and the introduction of special Diesel electric express services between Copenhagen and Jutland. The electrification of the Copenhagen suburban lines is now complete, the final section being opened in May last. The State granted 16.9 million kroner for this work, and 38 km. of route is now electrically operated. The policy of replacing steam by motor locomotives is being continued, and in the past two years the former were reduced by thirty-two, while the number of motor locomotives and electrically driven coaches rose by thirty-eight. With regard to broadcasting, there were 607,184 licence-holders at the end of June last. Telephone subscribers numbered 327,303 in January, 1936. This service is operated by six private companies and the State. The concessions of the former expire in 1939, and it is expected that the State will then take over complete control. Difficulty in obtaining permission to import the necessary material for the changing over of a number of exchanges to semi- and fully-automatic service is being experienced by the Copenhagen Telephone Co., and an arrangement has been made with the International Standard Electric Corporation to start a factory in Copenhagen for the manufacture of all such material. The Copenhagen company has subscribed one-third of the share capital of Kr.1,000,000.

For Sale

Halifax Corporation has for sale rotary convertors, transformers, h.v. feeder cubicles and l.v. panels and horizontal centrifugal pumps.

(See our classified advertisements.)

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price. December 2nd.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	–
a Ammoniac, Sal ... ... per ton	£36	–
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	–
a Borax ... ... ,,	£17	–
a Copper, Sulphate ... ... ,,	£15 10s.	–
a Potash, Chlorate ... ... per lb.	3¾d. to 4¼d.	–
a ,, Perchlorate ... ... ,,	6d.	–
a Shellac ... ... per cwt.	£4 18s.	–
a Sulphur Commercial ... ... per ton	£11	–
a ,, Roll ... ... ,,	£11	–
a Soda Chlorate ... ... per lb.	3¼d. to 3¾d.	–
a ,, Crystals ... ... per ton	£5 to £5 5s.	–
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	–
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	–
b ,, Wire ... ... per lb.	1/1 to 1/9	–
b ,, Sheet and Foil ... ... ,,	1/3 to 2/9	–
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£214	£1 inc.
Grade II... ... ... ,,	£147	–
Grade III ... ... ,,	£76	–
c Brass (rolled metal 2" to 12" basis) per lb.	8¼d.	¼d. inc.
c ,, Tubes (solid drawn) ... ... ,,	10¼d. to 10¾d.	–
c ,, Wire, basis ... ... ,,	8¼d.	¼d. inc.
c Copper Tubes (solid-drawn)... ... ,,	11¼d.	–
g ,, Bars (best selected)... ... per ton	£77	£2 inc.
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£49 5s.	£1 inc.
d ,, ,, Wire Rods ... ,,	£55 5s.	£1 inc.
d ,, ,, H.C. Wire ... per lb.	8 7/8d.	¼d. inc.
f Ebonite Rod ... ... ,,	1/6 to 2/- plus	–
f ,, Sheet ... ... ,,	1/3 to 1/6 10%	–
n German Silver Wire, Nos. 1 to 12 ... ,,	2/2	–
h Gutta-percha, fine ... ... ,,	nom.	–
h India-rubber, Para-fine ... ... ,,	1/-	¾d. inc.
i Iron, Pig (Cleveland, No. 3) ... per ton	67/6	–
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	–
g Lead, English Pig ... ... ,,	£24 15s.	£1 15s. inc.
g Mercury ... ... per bot.	£14 5s.	–
e Mica (in original cases) small ... per lb.	9d. to 1/6	–
e ,, ,, ,, medium ... ,,	5/- to 10/-	–
e ,, ,, ,, large ... ,,	10/6 to 17/6 up	–
p Phosphor Bronze, plain castings ... ,,	1/1	–
p ,, ,, drawn bars & rods ,,	1/0½d.	–
p ,, ,, rolled strip & sheet ,,	1/-	–
p ,, ,, wire ... ... ,,	1/1½d.	–
o Platinum ... ... per oz.	£9 15s.	–
d Silicium Bronze Wire ... ... per lb.	9 1/2d.	¼d. inc.
g Spelter... ... ... per ton	£16 13s. 9d.	18s. 9d. inc.
r Steel, Magnet, in bars ... ... per lb.	7¼d.	–
g Tin, Block (English) ... ... per ton	£230 10s.	£1 dec.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/11	–

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Cartridge Fuses for Railway Signalling

Specification No. 714 issued by the British Standards Institution is one of a series for materials and apparatus used for railway signalling. It is also one of a series of specifications for electric fuses. The manufacturer of the complete cartridge is not tied down to specific materials, being in this respect only subject to the clause that, whatever the material, it shall have no deleterious action on any part of the fuse during its life. The general construction of the fuse has not been stipulated, but the capping and overall dimensions have been rigidly standardised in order to ensure interchangeability. Sufficient data were available to define closely the performance of fuses for voltages up to 250 V, and definite performance limits have therefore been laid down for such voltages. Copies of the specification can be obtained from the British Standards Institution, Publications Department, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

New Catalogues and Lists

T.M.C. Harwell (Sales), Ltd., 233, Shaftesbury Avenue, London, W.C.2.—A list of desk and bedside lamps.

Mallinson & Eckersley, Ltd., Worsley Street, New Bailey Street, Manchester, 3.—A list of hardwood screens embodying radiant electric fires.

Dunford & Elliott, Ltd., Sheffield, 9.—A list of "Dunelt" electric fires.

Gordon Equipments, Ltd., 25, Milton Street, London, E.C.2.—Details of "Wincharger" wind-driven charging equipment.

Electric Depôt, Ltd., Pritchett Street, Aston, Birmingham, 6.—A catalogue of "E.D.L." adjustable workshop lighting fittings.

Johnson & Phillips, Ltd., Charlton, S.E.7.—A new technical publication dealing with "super-tension" cables.

Painter Bros., Ltd., 60, Hillmarton Road, Caledonian Road, London, N.7.—Details of a new system of unit construction for heavy-duty storage racks.

Mackay & Partners, Ltd., 109, Kingsway, London, W.C.2.—A leaflet giving details of "Waring" tubular heaters.

Higgs Motors, Ltd., Witton, Birmingham, 6.—A pocket stock list of electric motors.

Straight-Lite Reflectors, Ltd., 73, Canonbury Road, London, N.1.—List No. B.46 illustrating examples of the company's reflectors and direction signs, together with domestic wall and desk units, including the new No. 804 model.

J. H. Sankey & Son, Ltd., "Pyruma" Dept., Ilford.—Details of the "Pyruma" fire cement gun.

James Beresford & Son, Ltd., Cato Street Works, Birmingham, 7.—List P.12 giving particulars of the "Beresford Stork" automatic pressure water supply systems, &c.

Ferguson, Pailin, Ltd., High Openshaw, Manchester, 11.—New catalogue sections dealing with short-circuit testing and results of tests on Ferguson, Pailin circuit-breakers.

J. H. Holmes & Co., Ltd., Hebburn-on-Tyne.—A pamphlet describing heavy-current low-voltage generators for electroplating and electrolytic work.

Bankruptcy Proceedings

B. Rome (Lloyd Electric Lamp Co., wholesale electrical accessories dealers, 8, Rangoon Street, and lately of 4, Lloyds Avenue, E.C.). The firm failed in March, 1935, and on November 27th B. Rome, one of the four partners, applied to Mr. Registrar Parton at the London Bankruptcy Court for an order of discharge. The Official Receiver reported that the ranking liabilities amounted to £1,512, while the assets, valued at £450, had realised only £240. The applicant began business on his own account by selling electrical goods on a cash basis. In August, 1934, he was appointed sales manager to the Lloyd Electric Lamp Co., and was taken into partnership in the following September. The firm's failure was attributed to lack of capital, to having traded at too narrow a margin of profit to cover heavy overhead expenses, and to the inability of a partner to put in promised capital of £1,000. The discharge was suspended for nine months on three statutory grounds.

H. Bannister, 43, Old Moat Lane, Withington, Manchester, lately carrying on business under the style of Henry Bannister & Co., 8, Newmarket Lane, Manchester, as an electrical goods factor.—The application for discharge herein was heard at the Court House, Quay Street, Manchester, recently. The receiving order had been made in 1932 after four executions had been levied by creditors. The discharge was granted subject to fifteen months' suspension.

C. G. Crowther, 92A, King Cross Street, Halifax, radio electrician.—The first meeting of creditors in this matter took place on November 27th at the Official Receiver's Office, Hallfield Chambers, 71, Manningham Lane, Bradford. Debtor had prepared a statement of affairs which showed ranking liabilities of £194, with assets of £37, leaving a deficiency of £157. He said his failure was due to loss on a car, depreciation of stock, machinery, fixtures and fittings, and declining turnover. The case being a summary one was left in the hands of the Official Receiver, as trustee.

C. E. Hallam (Midland Radio Service), wireless and electrical engineer, 342, Meadow Lane, and 191 and 275A, Arkwright Street, Nottingham.—Last day for receiving proofs for dividend December 9th. Trustee, Mr. A. J. Rogers, 22, Regent Street, Park Row, Nottingham. Official Receiver.

J. Vigon (Modern Electrical Installations), electrical and radio engineer, 355, Commercial Road, E.1.—Last day for receiving proofs for dividend December 9th. Trustee, Mr. C. B. Park, Bankruptcy Buildings, Carey Street, W.C., Official Receiver.

A. Boards (the Southern), radio dealer, 253, Barlow Moor Road, Chorlton-cum-Hardy, Manchester.—Last day for receiving proofs for dividend December 9th. Trustee, Mr. F. H. Langmaid, Byrom Street, Manchester. Senior Official Receiver.

A. Plotzker, wireless dealer (described in the receiving order as G. A. Walsh, wireless dealer, 47, Woodstock Avenue, Golders Green, Middlesex.—Application for discharge to be heard on December 15th at Bankruptcy Buildings, Carey Street, W.C.

R. Mason, radio and electrical engineer, Crown Square, Kirbymoorside.—Trustee, Mr. C. L. Townsend, 80, High Street, Stockton-on-Tees, Official Receiver, released November 16th.

C. Armstrong-Lamb, electrician, 8, Clarendon Place, Hyde.—Last day for receiving proofs for dividend December 12th. Trustee, Mr. P. M. Milward, Byrom Street, Manchester, Official Receiver.

H. Cooke (Western Wireless), wireless and electrical engineer, 33, Fisherton Street, Salisbury.—Last day for receiving proofs for dividend December 16th. Trustee, Mr. H. T. Jones, 12, Rolleston Street, Salisbury, Official Receiver.

E. H. Newman and **D. E. Newman** (Newman & Co.), radio and electrical engineers, 17, Shepherd's Bush Green, London.—First and final dividend of 1s. in the £, payable at Bankruptcy Buildings, Carey Street, W.C.

A. Schnittlinger (described in the receiving order as A. Davis), 64, Coborn Road, Bow, E.—Application for discharge to be heard on December 16th at Bankruptcy Buildings, Carey Street, W.C.

P. T. Bradley, radio engineer, 1, The Arcade, and 10, Church Lane, Stafford.—Last day for receiving proofs for dividend December 8th. Trustee, Mr. R. E. Clark, 17, Albion Street, Hanley, Stoke-on-Trent.

H. Carnell, radio engineer, 94, East Hill, St. Austell.—First and final dividend of 1s. in the £, payable at 12, Princes Street, Truro.

C. E. Wheat (Radio Stores), lately of 2, Lichfield Road, Stafford.—Public examination December 9th at the Shire Hall, Stafford.

L. S. Walter, electrical engineer, 48, Broad Street, Banbury.—Trustee, Mr. J. B. Simmons, 8, Forbury, Reading, Official Receiver, released November 10th.

F. E. V. Hooper, electrical engineer, 26, Moorgate Avenue, Crookesmoor, Sheffield.—Trustee, Mr. L. T. Clegg, 14, Figtree Lane, Sheffield, Official Receiver, released November 13th.

H. Vernon, electrical contractor, 105, Palatine Road, Northenden, Manchester.—Trustee, Mr. P. M. Milward, Byrom Street, Manchester, released November 16th.

E. James, wireless engineer, Cusworth Lane, Doncaster.—Receiving order made November 24th on debtor's own petition.

E. T. Shaw, electrician, 17, Johnstone Road, East Ham.—Discharge suspended for three months until January 27th.

Company Liquidations

Phœnix Battery Co., Ltd., Roslyn Works, Roslyn Road, Tottenham.—The statutory first meetings of creditors and shareholders under the compulsory liquidation of this company were held on November 26th at the Board of Trade Offices, Carey Street, W.C.—Mr. H. P. Naunton, Senior Assistant Official Receiver, reported that the company was formed in March, 1936, to carry on the business of battery manufacturers. It appeared that a company known as Vale & Hardy, Ltd., had carried on business at Roslyn Works under the name of the Phœnix Battery Company between August, 1935, and March, 1936 That concern went into compulsory liquidation and this company was registered, but before it could obtain credit for goods, suppliers required a settlement of their outstanding accounts with Vale & Hardy, Ltd. Further, old customers of the last-named company required replacement of faulty batteries before they would renew their custom. It cost the company £223 to put those matters in order and the company ceased trading in June last owing £368 with no assets. The failure of the company was attributed to lack of working capital, the issued capital amounting only to £50, and to the utilisation of its available resources to pay off old liabilities of Vale & Hardy, Ltd. The liquidation was left in the hands of the Official Receiver.

High Level Batteries, Ltd.—Particulars of claims by December 16th to the liquidator, Mr. T. Rodger, 34, Grainger Street, Newcastle-upon-Tyne. Meeting December 28th at 34, Grainger Street to receive an account of the winding-up by the liquidator.

Electric Heating & Hardware, Ltd.—Particulars of claims by January 16th to the liquidator, Mr. E. Tolson, Clayton Road, Hayes, Middlesex.

Kirkby Stephen Electric Light & Power Co., Ltd.—Meeting January 4th at Market Square, Kirkby Stephen, Westmorland, to receive an account of the winding-up by the liquidator, Mr. R. R. Sowerby.

Kyffin Hughes, Ltd.—Particulars of claims by December 31st to the liquidator, Mr. C. F. Carlisle, 15, Park Row, Nottingham.

Hampshire Light Railways (Electric) Co., Ltd.—Meeting, December 30th at 1, Queen Victoria Street, E.C.4. to receive an account of the winding-up by the liquidator, Mr. E. J. G. Webb.

Gosport and Alverstoke Electric Lighting Co., Ltd.—Meeting December 30th at 1, Queen Victoria Street, E.C., to receive an account of the winding-up by the liquidator, Mr. E. J. G. Webb.

Cardiff Tramways Co., Ltd.—Meeting December 30th, at 1, Queen Victoria Street, E.C.4, to receive an account of the winding-up by the liquidator, Mr. E. J. G. Webb

Allwave International Radio & Television Corporation, Ltd.—Meetings December 29th at 185-188, High Holborn, W.C., to receive an account of the winding-up by the liquidator, Mr. C. Latham.

Broom & Wade, Ltd.—Meeting December 30th at the registered office of the company to receive an account of the winding-up by the liquidator, Mr. A. E. Bauchamp. This notice relates to the old company whose business has been acquired by a public company of the same name.

Dissolution of Partnership

Widcombe Radio & Electrical Service, radio and electrical engineers, 4, Sussex Place, Widcombe, Bath.—Messrs. W. E. Miller, M. G. Monger and S. C. O'Shea have dissolved partnership. Messrs. W. E. Miller and M. G. Monger will attend to debts and carry on the business.

Electricity Supply

Lighting, Domestic, Power

Barnes.—ELECTRICAL SCHEME CHOSEN.—Having considered the merits of steam, oil and electricity for driving new plant to be installed at the Barnes works for supplying water at high pressure for sand washing, the Metropolitan Water Board Works Committee is of the opinion that the most economical scheme is the installation of two electrically driven pumps, each capable of pumping 500,000 gal. per day against a head of 300 ft. It is proposed to purchase electricity from the local authority at 0.66d. per kWh (off-peak). The cost of installing the plant is £2,300, and the estimated annual working expenses are £415, compared with £521 at present.

Elaborately decorated trams that took part in a procession during the celebrations in connection with the completion of the new Diet building in Tokyo, a model of which appears in the foremost car

Beauly.—MERGER ANTICIPATED.—The Beauly Electric Supply Co., Ltd., is likely to be merged with the Grampian Electricity Supply Co. The Beauly Co. generated its own electricity some years after its inception, but is now operated by the Ross-shire Electric Supply Co., Ltd.

Bexhill-on-Sea.—LOANS.—The Corporation has applied for a loan of £6,000 for mains and services.

Birkenhead.—SUB-STATION.—A sub-station is to be provided in Kendal Street at a cost of £3,140.

Caistor (Lincs).—RURAL SUPPLIES.—When the Rural District Council recently gave its formal consent to the erection of overhead lines for the extension of the electricity supply along the Caistor Road, Market Rasen, it was stated that some of the villages in the area were very anxious to obtain a supply.

Cockermouth.—NEW TARIFF.—A domestic two-part tariff with a running charge of ¾d. per kWh is being introduced by the Mid-Cumberland Electricity Co., the fixed charge being based upon the size of the house.

Coventry.—EXTENSIONS.—At a cost of £22,075 the Electricity Committee is to extend mains and sub-station plant.

Croydon.—SUPPLY TO FLATS.—The Electricity Committee is to extend mains and plant at a cost of £3,740 to supply flats, &c., at Upper Norwood.

SAFEGUARDING THE POWER STATION.—On the advice of the Electricity Commissioners the Council has decided to spend £500 on measures to prevent fires at the generating station.

Cromer.—CHANGE-OVER.—The East Anglian Electric Supply Co., Ltd., is applying to the Electricity Commissioners for permission to alter the system in the urban district from d.c. to a.c.

Devizes.—EXTENSIONS.—The Rural District Council has decided not to object to the erection of overhead lines by the West Wilts Electric Light & Power Co., Ltd., at Bromham, Great Cheverell, Market Lavington, Potterne and Seend.

Edinburgh.—CHRISTMAS ILLUMINATIONS.—There is to be floodlighting of the Castle and the Scott Monument during Christmastide, and special rates are being offered by the Electricity Committee for shop lighting.

Huddersfield.—SURVEY OF SHOP-WINDOW LIGHTING.—Writing in the *Huddersfield Examiner*, Mr. W. M. Wilcox, B.Sc., M.I.E.E., head of the Electrical Engineering Department of the Huddersfield Technical College, states that his triennial inspection of shop-window lighting in the district has revealed a disappointing state of affairs. In three years the percentage of marks for the whole area surveyed has only increased from 56 to 56.5. He suggests that local electrical contractors should organise a campaign and visit all the premises that are unprogressive as regards lighting.

Irish Free State.—LIFFEY BILL AMENDMENT.—On the report stage of the Liffey Reservoir Bill, 1936, the Minister for Industry and Commerce moved an amendment to give him power to fix, subject to the agreement of the Electricity Supply Board and the Dublin Corporation, a lower water level than had been set out in the agreement. The idea, he said, was to fix a scale of levels, some of which might be below the minimum set out in the agreement. These levels would be fixed in seasons when rain might reasonably be expected, so that there would be little danger of a deficiency. The amendment was agreed to and the report stage was passed.

Kincardineshire.—ELECTRICITY IN SCHOOLS.—A draft agreement drawn up by the Grampian Electricity Supply Co. for supplying electricity to schools, which the Education Committee believes will lead to a substantial annual saving in charges for heating and lighting, is being brought to the notice of the County Council.

Leeds.—MEETING THE INCREASING DEMAND.—A report was presented to the Electricity Committee recently by the manager, Mr. C. Nelson Hefford, regarding the capacity of the generating plant at Whitehall Road and the demand experienced at that station. It was agreed that an additional high-voltage cable should be laid between the Kirkstall and Whitehall Road stations in order that power from Kirkstall might be used to meet the need. The cost, with transformers and switchgear, is estimated at about £120,000.

Leyton.—PURCHASE OF COOKERS.—As the loan of £10,000 sanctioned in May last year for the purchase of electric cookers in connection with the Corporation's hire scheme has been expended, application is to be made for permission to borrow a further £10,000.

CORONATION CONCESSION.—From May 8th to 17th inclusive the Electricity Department is to provide supplies free of charge for special illuminations.

KITCHEN EQUIPMENT.—At the request of the director of education the Electricity Department is to supply further cooking equipment (steaming and roasting ovens) for the Harrow Green Central Kitchen, on the same terms as apparatus previously supplied.

London.—HAMMERSMITH.—The inclusive charge for electricity and the hire of lighting installations to prepayment-meter consumers under the assisted-wiring scheme is ordinarily restricted to installations not exceeding six points, but the Council has now agreed to extend this to eight points.

In approved cases standard-size domestic electric cookers are to be supplied free of hire charge to schools in the borough for the use of cookery classes.

POPLAR.—Where the d.c. supply network requires augmenting, the Electricity Committee proposes to change-over the system to a.c., and for this purpose application is being made for general sanction to change-over the d.c. system when and where necessary.

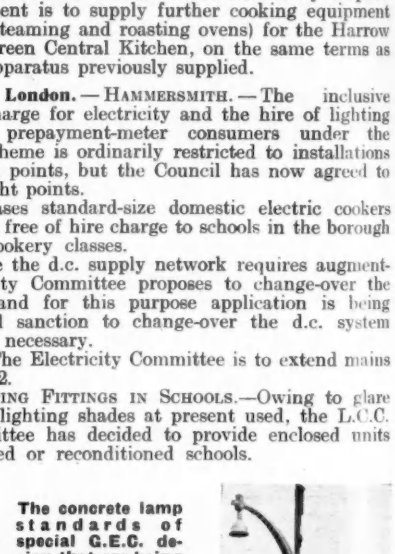
ST. PANCRAS.—The Electricity Committee is to extend mains at a cost of £1,212.

ELECTRIC LIGHTING FITTINGS IN SCHOOLS.—Owing to glare with the electric lighting shades at present used, the L.C.C. Education Committee has decided to provide enclosed units in new, remodelled or reconditioned schools.

STOKE NEWINGTON.—The Electricity Committee is to improve the lighting and provide an a.c. supply in Albion Road and Church Street at a cost of £2,500.

An improvement of the supply in the Dunsmure Road and St. Andrew's Mews areas is to be effected by the Electricity Committee at an estimated cost of £3,500.

Sanction is being sought to a loan of £5,000 for the provision of sub-station equipment.



The concrete lamp standards of special G.E.C. design that are being erected in Fulham carry a "Di-fractor" lantern for a 400-W "Osira" discharge lamp

Manchester.—POWER STATION EXTENSIONS.—Sanction to a loan of £214,000 for extensions at the Stuart Street power station is being sought by the Electricity Committee.

Mildenhall.—UNDERTAKING ACQUIRED.—The electricity undertaking of Parker Bros., who give a supply to Mildenhall,

Worlington, and Barton Mills, has been taken over, together with the goodwill of the business, by the East Anglian Electric Supply Co., Ltd.

Palestine.—EFFECT OF CURFEW ON ELECTRICITY UNDERTAKING.—As a result of the curfew in Jerusalem during the six-months' disturbances, £800 a month is estimated to have been lost by the Jerusalem Electric and Public Service Corporation. Nevertheless, from this month tariffs will be reduced by about 20 per cent. The reduction had been planned some time ago, states the Corporation, but was delayed owing to the disturbances.

Pontardawe.—REGIONAL SUPPLIES.—The Rural District Council has considered a report regarding a scheme for securing one regional electricity supply for Pontardawe, Neath, Brynamman and other adjacent districts. A meeting of the chairmen and electrical engineers concerned is to be convened.

[*Elec. Rev.* photo

Special illuminated platform upon which mannequins are taught deportment at the Gloria and Dawn Mannequin Studio, British Industries House, London, W.

Rotherham.—EXTENSION OF AREA.—Power to add to its supply area those parts of the parishes of Dalton and Whiston recently added to the borough is sought by the Corporation, *inter alia*, in a Bill to be promoted in the present session of Parliament.

South Africa.—MORE ELECTRICITY USED IN DURBAN.—Satisfactory electrical expansion is revealed in the annual statistics of the Durban Electricity Department. The gross sales of electricity show an increase of 13.35 per cent., as compared with the record increase of 15 per cent. in 1934-35. Consumers increased from 27,662 to 29,504.

DOMESTIC ELECTRICAL PROGRESS IN CAPE TOWN.—August 31st completed the sixth year of operation of the Cape Town Electricity Department's scheme for the hire-purchase of domestic appliances. In that time the annual consumption of electricity for domestic purposes rose from 10,741,630 kWh to 92,704,172 kWh.

South Shields.—REVISION OF CHARGES.—Modification of electricity charges for domestic and business consumers is being considered by the Electricity Committee. It is proposed that a two-part tariff shall be introduced. Industrial power rates will remain unaltered.

Stoke-on-Trent.—NEW TARIFF.—An alternative tariff for supplies to business premises of £10 per annum per kW of lamps installed and ¾d. per kWh used, with a minimum fixed charge of 12s. 6d. per quarter, has been adopted by the City Council. At the same time, there is to be an alternative rate for supply to cinemas of £8 per annum per kW of maximum demand and ¾d. per kWh.

LOANS.—The Electricity Commissioners have sanctioned loans as follows: High-voltage cable extension from Hollybush to Hem Heath sub-stations (£6,250) and provision of equipment and sub-station, Anchor Road, Longton (£2,200).

SUB-STATION DEVELOPMENTS.—Application is to be made to the Electricity Commissioners for sanction to borrow £4,350 for the erection of a sub-station at Bankhouse Road, Hanford, and £6,612 for the erection of one at James Street, Stoke; tenders have been accepted. The designs for sub-stations at Gate Street and Sutherland Road, Longton, have been approved by the Electricity Committee.

STREET LIGHTING.—Following the rejection by the City Council of the Electricity Committee's offer to provide a system of lighting on several of the main roads in the city, the Committee has requested the Gas and Highways Committees to appoint representatives to meet it to discuss the general question of street lighting. The Committee has decided to improve the electric lighting in parts of Lichfield Street and Fenton Road, Hanley, and Victoria Road, Fenton, the cost of the necessary services, columns and fittings (£1,600) being charged to the reserve fund.

CHANGE-OVER.—A.c. mains are to be provided in Goddard Street, Longton, at an estimated cost of £900.

BULK-SUPPLY AGREEMENT.—The Stone Urban District Council has asked for a reduction in the terms of the existing bulk-supply agreement. Consideration of the matter has been deferred.

U.S.S.R.—THE CHIRCHIK HYDRO-ELECTRIC SYSTEM.—Plans have now been approved for the construction of an extensive system of hydro-electric stations on the Chirchik River, states the *Monthly Review* of the U.S.S.R. Trade Delegation in Great Britain. The project, the second largest of its kind in Russia after the Dniepr system, is designed to supply power for the irrigation of the Tashkent Oasis and the production of nitrogen fertilisers for the cotton districts of Central Asia. The first experiment in this district was made when a 4,000-h.p. hydro-electric station was built on the Boz-Su Canal. Next to be constructed was a station of 18,000-h.p. capacity. Now an entire system of such stations is being erected with a total capacity of 60,000 h.p., capable of satisfying the industrial and municipal needs of the city of Tashkent and the surrounding district. This lesser system utilises the power of the lower reaches of the Chirchik River, but the main stations of the system will be built on the upper reaches, between the villages of Yamanjar and Troitskoe. There will be three stations in this group with an aggregate capacity of 272,000 kW, and an output of approximately 1,150 million kWh. The largest will be the station at Troitskoe with a capacity of 112,000 kW and an output of 470 million kWh per year. Much of the power of these stations will be used for the production of nitrogenous fertilisers. In the Tashkent Oasis alone nearly two million acres of land will be irrigated. According to the plan the first two stations will be ready for operation towards the end of 1937, and by the middle of 1939 the entire system should be finished. Railway lines and tracks have been laid. A dam laid below the Troitskoe hydro-electric station will permit normal working of the Tashkent Oasis irrigation scheme during construction of the power station.

Whitley Bay.—OVERHEAD LINES.—The application of the North-Eastern Electric Supply Co., Ltd., to the Ministry of Transport for permission to erect a 20,000-V overhead line across the fields north of Murton to a new sub-station near Grange Park and Monks Road is not to be opposed by the Urban District Council, which stipulates, however, that the line must be placed underground when any development takes place.

The company is also to lay a 20,000-V underground cable along certain streets in the district.

Traction

Cheshire.—POWER FOR RAILWAY ELECTRIFICATION.—In connection with the electrification of the L.M.S. Wirral section lines from Birkenhead Park to West Kirby and New Brighton, it is now announced that power for the trains will be supplied from six sub-stations situated at Birkenhead North, Bidston, Moreton, Meols, Hoylake and Wallasey, all controlled by an operator at Birkenhead North. A new repair shop for the electric trains is to be built at Birkenhead North and excavation of the site is proceeding. A feature of the track contact system is that the bonds for the conductor and running rails are being welded to the rails. Much of the permanent way

A deputation from the Belfast Corporation Tramways and Motor Department, with company officials, during a recent inspection of the latest type of A.E.C.-English Electric trolley-bus at Southall. Major R. McCreary, M.C., B.Sc., general manager and engineer at Belfast, is in the centre

is being relaid and entirely new lines, on a new embankment, are being laid between Bidston Sation and Seacombe Junction to increase the track capacity between these two points. It is probable that the electrification of the Wirral lines will be completed by next Easter.

Darlington.—TRANSPORT PLANS.—The purchase of four trolley-buses owned by the Rotherham Corporation is being considered by the Darlington Gas and Electricity Committee.

Furthermore, a sub-committee has been appointed to discuss the separation of the Transport Department from the Electricity Department.

Lytham St. Annes.—ABANDONMENT OF TRAMS.—A decision has been reached by the Council to abandon trams along the sea front in favour of buses.

Rotherham.—TROLLEY-BUS LEGISLATION.—A Bill which is to be promoted by the Corporation in the present session of Parliament seeks to empower the Corporation, among other things, to use trolley-vehicles in place of omnibuses along certain routes.

South Africa.—A LONG ELECTRIC RAILWAY.—Electrification of the 300-mile section, in Natal, of the Durban-Johannesburg Railway is now nearly finished. Work on the main part, in Central Natal, was carried out some years ago, and the line has now been electrified as far as Durban. Delivery of the necessary additional electric locomotives ordered from England is expected early in the New Year. The cost of overhead equipment on the new section will probably be slightly below £1,000 per mile. The power supply for the whole main line comes from Colenso.—*Reuter* (Durban).

Southampton.—PROPOSAL TO OPERATE TROLLEY-BUSES.—The Borough Council has unanimously decided to promote a Parliamentary Bill in the current session of Parliament for powers to operate trolley-buses on existing tram and other routes.

Southern Railway.—FURTHER ELECTRIFICATION.—It is reported that the direct route to Hastings will be included in the railway company's five-year electrification plan. It will shorten the time of the journey by a quarter of an hour. Electrical operation has now started on the Weybridge to Virginia Water section.

South Shields.—TROLLEY-BUSES.—The second section of the Council's trolley-bus service will come into operation in the spring of next year, and will cover the Stanhope Road area. The first section, which was started early in October, is meeting with considerable success. The total cost of the new service is estimated at £40,000.

Communications

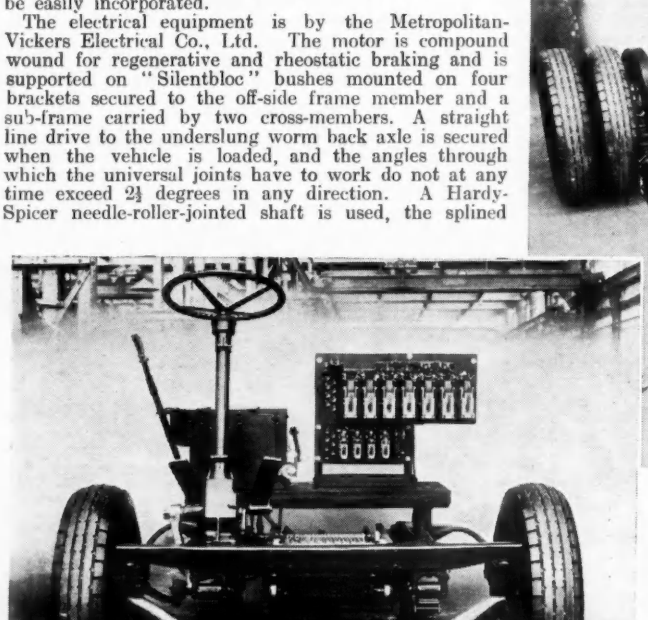
Great Britain.—POST OFFICE FINANCE.—A review of the progress of the Post Office for the year ended March 31st last has just been issued. The total value of transactions with the public amounted to £901,000,000, representing an increase of £40,000,000 over the previous year. Inland telegrams, after years of decline, showed an increase of 9,000,000 from 35,500,000 in 1934-5; the number of overseas telegrams remained almost stationary at 8,700,000. Reduced charges and improved trade increased the telephone business. Calls up to 4d. numbered 1,722,000,000 (+127,000,000) and trunk calls were 99,000,000 against 86,000,000. The number of instruments in service rose by 191,200 to 2,579,000.

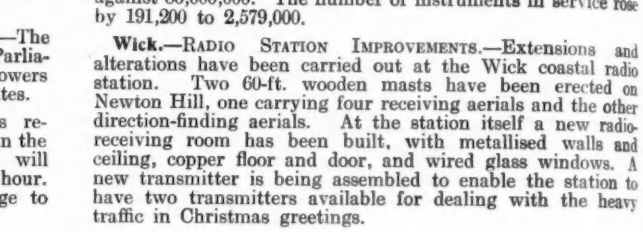
Wick.—RADIO STATION IMPROVEMENTS.—Extensions and alterations have been carried out at the Wick coastal radio station. Two 60-ft. wooden masts have been erected on Newton Hill, one carrying four receiving aerials and the other direction-finding aerials. At the station itself a new radio-receiving room has been built, with metallised walls and ceiling, copper floor and door, and wired glass windows. A new transmitter is being assembled to enable the station to have two transmitters available for dealing with the heavy traffic in Christmas greetings.

Daimler Trolley-buses

ELECTRIC trolley-buses are now being made by the Daimler Co., Ltd. Two types are offered, a four-wheeler, which was exhibited for the first time at the Scottish Show, and a six-wheeler, designed on similar lines. The chassis is not an adaptation of the petrol or oil bus type, but has been designed specially, being planned so that the requirements of almost any specification can be met without a great deal of alteration to the standard components. Regenerative control, rheostatic braking, vacuum or air pressure systems, &c., are obtainable, and the "battery manœuvring" feature can be easily incorporated.

The electrical equipment is by the Metropolitan-Vickers Electrical Co., Ltd. The motor is compound wound for regenerative and rheostatic braking and is supported on "Silentbloc" bushes mounted on four brackets secured to the off-side frame member and a sub-frame carried by two cross-members. A straight line drive to the underslung worm back axle is secured when the vehicle is loaded, and the angles through which the universal joints have to work do not at any time exceed 2½ degrees in any direction. A Hardy-Spicer needle-roller-jointed shaft is used, the splined





Two views of the new Daimler trolley-bus chassis

portion being 3 in. in diameter and working in an oil bath, the loading in the splines being reduced to a very low figure, about one-fifth of that usually imposed.

The motor and axle "pot" is offset to the nearside, providing a clear gangway along the centre of the lower saloon. The fully floating back axle has 8-in. worm centres giving a reduction ratio of 9.33 to 1. The axle shafts are of 75-ton steel with enlarged ends to give a star drive to the wheel hubs. Special cast-iron brake drums are detachable without removing the hubs, and are Ferodo lined. R.P. automatic adjustors are fitted to the shoes. Brakes are applied by the Westinghouse air pressure system and independently by a hand lever of the ratchet type.

An air compressor of 4.8 cu. ft. capacity driven by a ¾-h.p. motor is mounted on the off-side of the chassis, which also carries the air reservoir and a Metrovick-C.A.V.-Bosch motor-generator set for low-voltage lighting.

The master controller is carried on a multi-plywood platform fixed to the chassis frame. The operating levers project through the bottom of the casing and wooden platform and are attached to the rods, which in turn are coupled to the pedal controls. Secondary insulation is provided just forward of the drop lever connections. The contactor panel is flexibly supported on the nearside of the master controller, but it may, as an alternative, be rigidly fixed to the rear bulkhead with an inspection door to give access to the electrical connections.

The six-wheel chassis is of similar construction and arrangement, but the bogie axles have 7-in. worm centres, and the foremost axle incorporates the Kirkstall patented third differential which can be removed without disturbing the worm shaft. The worm casings are of electron with Timken bearings mounted in steel sleeves. The bogie is fitted with the Kirkstall patented suspension system having a single road spring on each side of the vehicle, the top leaves being extended to form additional anchorage for the axles so that they take all braking and driving reactions.

Other items of equipment include a speedometer driven from the forward end of the main motor, grouped nipple system of chassis lubrication, towing hooks on the front axle and at the rear of the frame, and an Exide "Ironclad" lighting battery.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Amble.—December 14th. U.D.C. Electricity Department. Cables, feeder pillars, 2,200-V overhead line. (November 20th.)

Australia.—MELBOURNE.—December 8th. Posts and Telegraphs Department. Underground and submarine cable and loading coil case. (T.Y. 30939.)*

Bingley.—Electricity Department. Main and service joint boxes. (See this issue.)

Cardiff.—December 7th. King Edward VII Welsh National Memorial Association. X-ray equipment for the Sealyham Hospital, Wolf's Castle. F. J. Alban, secretary, Memorial Offices, Westgate Street.

December 9th. R.D.C. Two 11,000/400-V, 3-phase transformers. H. Jackson, electrical engineer and manager, 20, Park Place (deposit £1 1s.).

Cleethorpes.—December 14th. Borough Council. Cable, switchgear, rectifiers, complete with transformers, and remote control equipment. (November 27th.)

Derby.—December 12th. Borough Council. Domestic apparatus control equipment. (See this issue.)

Dewsbury.—December 11th. Borough Council. Electric wiring of the extensions at the Wheelwright Grammar School for Boys. Borough electrical engineer, Bradford Road.

Dumfries.—December 18th. Electricity Department, Two transformers and switchboards. (November 20th.)

Durham.—County Council. Electrical installations at the new Mental Deficiency Colony, School Aycliffe, Heighington. Particulars from T. Taliesin Rees & R. Holt, architects, 64, Rodney Street, Liverpool, 1 (deposit £2 2s.), by December 12th.

Eccles.—December 9th. Electricity Committee. One 500-kVA, 3-phase, oil-cooled transformer. Borough electrical engineer, Electricity Offices, 1, King Street.

Epsom and Ewell.—December 14th. U.D.C. Electricity Department. Cable. (November 20th.)

Farnworth.—December 10th. U.D.C. Electricity Department. Cables. (November 20th.)

Fife.—December 7th. County Council. Electrical installations in forty houses at Hill of Beath. C. R. Douglas & Son, 15, East Port, Dunfermline (deposit £1 1s.).

December 5th. Electrical installation in 140 houses at Dundonald. J. Gentles & Son, Central Chambers, Kirkcaldy.

Electrical installation and heating engineering work at Tayport Higher Grade schools. G. Sandilands, county master of works, Property and Works Department, County Offices, Wemyssfield, Kirkcaldy (deposit £1 1s.).

December 12th. Electric lighting at twenty-two houses at Milton of Balgonie. J. Gentles & Son (deposit £1 1s.).

Grimsby.—December 19th. Corporation. One steam generating unit and ancillary plant. (See this issue.)

Hastings.—December 24th. Electricity Department. Kiosk with h.v. and l.v. control for transformer. (See this issue.)

Irish Free State.—ELECTRICITY SUPPLY BOARD.—January 8th. P.i. cables. (See this issue.)

Kettering.—December 23rd. U.D.C. Electricity Department. One 6-panel and one 5-panel duplicate bus-bar switchboards and two 3,000-kVA transformers. (November 27th.)

London.—LONDON AND HOME COUNTIES J.E.A. December 19th. Rectifying plant at Twickenham. (See this issue.)

BATTERSEA.—December 14th. Borough Council. Coal for one year. (See this issue.)

ISLINGTON.—January 13th. Borough Council. Electrical and engineers' stores for one year. (See this issue.)

Long Eaton.—December 15th. U.D.C. Electricity Department. Cable. (See this issue.)

Manchester.—December 19th. Electricity Committee. Pumps and coal-handling crane and grab. (See this issue.)

Milford Haven.—December 30th. U.D.C. Electricity Committee. Cable, switchgear, transformers, rectifier, distribution gear and remote control supervisory gear. (See this issue.)

Morley.—December 15th. Housing Committee. Various works, including electrical, at fifty houses on the Baker Street estate. Borough engineer, Town Hall (deposit £2 2s.).

New Zealand.—WELLINGTON.—February 16th. Public Works Department. Four 5,000-kVA transformers. (T. 30943.)*

Northern Ireland.—BELFAST.—December 15th. Town Council. Two electrically driven horizontal centrifugal pumps (250-gal. per min. each), with cabling, switch- and control gear, for the Ormeau Avenue baths. City Surveyor's Department (Engineering Section), Room 94, City Hall.

December 14th. Electricity Committee. 33-kV, 3-phase, duplicate bus-bar, armourclad switchgear. (See this issue.)

Plymouth.—December 12th. Corporation. Coal-handling conveyor, telpher and extensions to existing coal-handling equipment. (November 20th.)

Saltcoats.—December 8th. Town Council. Electric wiring of 162 houses. H. Thomson & Sons, architects and surveyors, 60, Hamilton Street (deposit £1 1s.).

Seaton Valley.—December 15th. U.D.C. Wiring ninety-eight houses on the Grange estate, Shiremoor. (See this issue.)

Sheffield.—December 10th. Electricity Committee. Transformers, switchgear, cooling tower and steam and water piping. (November 27th.) Transformers. (See this issue.)

South Africa.—PRETORIA.—December 30th. Public Works Department. Electric lifts. (T. 2153.)*

JOHANNESBURG.—December 12th. Municipality. Electricity meters. (T.Y. 30956.)*

Staffordshire.—County Council. Electric lighting and power in the new Victoria Road Technical College, Stafford. (See this issue.)

Stoke-on-Trent.—December 9th. North-West Midlands Joint Electricity Authority. Fire protection apparatus at the Stoke-on-Trent and Stafford generating stations. (November 20th.)

Turriff.—December 11th. Town Council. Electric lighting installations in three blocks of houses. Burgh surveyor.

West Riding.—December 31st. County Council. Electric lighting and l.p. hot water apparatus at the extensions of the Hemsworth West End Council school and electric lighting at Wickersley new junior and infants' school. Education officer, County Hall, Wakefield.

Wolverhampton.—December 15th. West Midlands Joint Electricity Authority. Three 4,000-kVA, outdoor-type transformers, with on-load tap-changing apparatus. (November 20th.)

York.—December 14th. Corporation. Electrically driven, vertical spindle, centrifugal pump at the sewage disposal works, Naburn. C. J. Minter, city engineer, Guildhall (deposit £1 1s.).

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Barking.—Electricity Committee. Accepted. Switchgear.—Bertram Thomas (£180); Drake & Gorham, Ltd. (£127); A. Reyrolle & Co. (£5,429). Feeder pillars.—W. Lucy & Co. (£498); Siemens Bros. & Co. (£186).

Birkenhead.—Electricity Committee. Accepted. Three transformers for the Barlow Avenue, Manor Hill and Swan Hill sub-stations (£478), and l.v. switchboard (£342).—General Electric Co. H.v. switch unit and accessories (£230).—Met.-Vick. Electl. Co.

Bridlington.—Town Council. Accepted. Street lighting improvement scheme (£4,637).—Engineering & Lighting Equipment Co.

Chesterfield.—Corporation. Accepted. Cables (£4,902).—B. I. Cables. Switchgear, transformer, induction regulator, switch cubicles and control panel (£8,107).—B.T.H.

Guisborough.—U.D.C. Accepted. Cables (£1,284).—W. T. Glover & Co.

Hull.—Telephones Committee. Accepted. Cable (£580).—B.I. Cables, Ltd. Bronze wire (£407).—F. Smith & Co.

London.—POPLAR.—Contracts Committee. Heating and ventilating services at the Town Hall:

	£		£
D. Smith & Co. (tender withdrawn)	19,811	**G. N. Haden & Sons (Recommended)**	**21,473**
Sulzer Bros. (London)	20,564	Brightside Foundry & Engg. Co.	22,334
General Electric Co.	21,473	Ray Heating Co.	24,107

Electric passenger and goods lifts:

	£		£
Marryat & Scott. Accepted ...	**{2,958 {3,218**	Express Lift Co.	**{3,666 {4,218**

Recommended. Internal telephone installation (£1,315).—Standard Telephones & Cables.

L.C.C.—Housing and Public Health Committee. Electrical installations in about 766 houses and flats at Becontree (Dagenham area, No. 10 contract):

	£		£
Newman and Watson, Ltd. Accepted	**6,750**	Pinching and Walton	8,727
Ryland's Electrical Co.... ...	6,871	City Electrical Co.	8,800
Ilford Electrical Co.	7,249	Electrical Installations, Ltd. ...	9,182
Evans and Shea...	7,851	A. Hawkins and Sons	9,562
Springvale Electrical Co. ...	7,890	Jacob, White and Co.	9,815
S. Reed and Sons	7,983	Read and Partners, Ltd. ...	10,092
Archibald Meckhonik	8,306	The chief engineer's comparable estimate	7,277
David Myer and Co.	8,657		

Wiring and fittings for electric lighting, &c., in one block of dwellings on the Church Street site, Stoke Newington:

	£		£
Pemberton and Sturgess (Great Britain), Ltd. Accepted ...	**870**	W. H. Gaze and Sons	955
Houchin, Ltd.	909	F. G. Edey and Co.	996
A. Dean and Co.	911	E. Beckwith and Co.	1,064
Jacob, White and Co.	936	Twentyman and Willmott, Ltd.	1,140
Grant and Blake Ltd.	941	A. J. Hewens and Sons	1,604

Wiring and fittings for electric lighting in one block of dwellings in the Gaselee Street area, Poplar:

	£		£
Carr Bros. Accepted	**559**	E. W. Merredew	708
Pemberton and Sturgess (Great Britain), Ltd.	575	Anderson Angell and Co. ... Arthur Cozens	720 728
Archibald Meckhonik	613	Ellis and Ward, Ltd.	748
G. E. Thomas and Co.	674	A. J. Hewens and Sons	846

Electric bed lift at St. Olave's Hospital:

	£		£
Marryat and Scott, Ltd. Accepted	**800**	Waygood-Otis, Ltd.	991
J. and E. Hall, Ltd.	885	Express Lift Co.	1,030
Pickerings. Ltd.	905		

Wiring and fittings for electric lighting and power at the Goldie Leigh Hospital, Abbey Wood:

	£		£
Read and Partners, Ltd. Accepted	**3,282**	Collins Electrical, Ltd.	3,850
Buchanan and Curwen, Ltd. ...	3,329	Higgins and Cattle, Ltd. ...	4,092
Berkeley Engg. Co.	3,340	T. Clarke and Co.	4.290
F. G. Edey and Co.	3,395	W. J. Furse and Co. (London), Ltd.	4,410
Arthur Cozens	3,524	Woolwich Borough Council ...	5,080
A. Hawkins and Sons	3,599		

Wiring and fittings for electric lighting, power, &c., at Paddington Hospital :

	£		£
L. G. Tate and Co. Accepted ...	1,642	Read and Partners, Ltd. ...	1,874
Malcolm and Allan (London), Ltd.	1,769	Bell, Bros. and Co. (London), Ltd.	1,880
Bower Engg. Works (Electrical and General), Ltd.	1,801	Smith and Hammond, Ltd. ...	1,949
Overhead, Ltd.	1,825	W. J. Furse and Co. (London), Ltd.	1,980
Jacob, White and Co.	1,831	Samuel Read and Sons	2,248
F. G. Edey and Co.	1,850		

Manchester.—Electricity Committee. Accepted. Internal telephones in Town Hall extension.—Standard Telephones. 400-V sub-station switchgear for twelve months.—Parmiter, Hope & Sugden, Ltd.; Bertram Thomas. Motor driven boiler feed pump.—Harland Engineering Co., Ltd. 420-V switchgear for Barton power station.—Met. Vick. Electl. Co. 33,000- and 6,600-V switchgear for Dickinson Street station.—Ferguson, Pailin, Ltd. Additions and modifications to switchgear at Stuart Street and main transforming stations.—A. Reyrolle & Co.; B.T.H. 660-V switchgear for trolley-bus stations.—Bertram Thomas.

Waterworks Committee. Accepted. Cable.—B.I. Cables, Ltd.

Middlesbrough.—Education Committee. Accepted. Electric lighting in new school (£972).—Devereux Moodie & Co.

Sheffield.—Electricity Committee. Accepted. One 50,000-kW turbo-alternator, with ancillary plant (£175,589).—Met.-Vick. Elecl. Co. One boiler with ancillary plant (£64,594).—Mitchell Engineering Co. Increasing breaking capacity of 33-kV switchgear at Blackburn Meadows power station (£12,910), modification of sub-station switches (£5,965), and modernising switchgear at Neepsend power station (£44,870).—A. Reyrolle & Co.

Slough.—U.D.C. Accepted. Installation of electricity in 146 houses at Langley (£516).—Slough Electrical Co.

South Africa.—CAPE TOWN.—Town Council. Accepted. Equipment for the Table Bay power station : Boiler (£95,652).—Babcock & Wilcox, Ltd. Turbo-alternator and condensing plant (£104,842).—C. A. Parsons & Co. Additional circulating water pumping unit, including a Brackett screen (£6,750).—Drysdale & Co.

Stoke-on-Trent.—Housing Committee. Recommended. Wiring and fittings for 108 houses on the Cornhill estate (£632).—J. Hilton.

Electricity Committee. Accepted. Test room battery (£429).—D. P. Battery Co.

Forthcoming Events

Institution of Electrical Engineers.—Monday, December 7th. Institution, London, W.C.2. 7 p.m. Informal meeting. Discussion on "Should the I.E.E. Wiring Regulations be Applied to Installations of Thirty Years Ago?" To be opened by Mr. R. Grierson.

East Midland Sub-Centre.—Friday, December 4th. Victoria Station Hotel, Nottingham. 6.45 for 7.15 p.m. Annual dinner.

Meter and Instrument Section.—Friday, December 4th. Institution, London, W.C.2. 7 p.m. Joint meeting with members of the Wireless Section. "The Post Office Speaking Clock." Messrs. E. A. Speight and O. W. Gill.

Tees Side Sub-Centre.—Friday, December 4th. Linthorpe Assembly Rooms, Middlesbrough. Annual dance.

Mersey and North Wales (Liverpool) Centre.—Monday, December 7th. The University, Liverpool. 7 p.m. "Recent Developments in Telegraph Transmission and Their Application to the British Telegraph Services." Messrs. L. H. Harris, E. H. Jolley and F. O. Morrell.

North Midland Centre.—Tuesday, December 8th. Hotel Metropole, Leeds. 7 p.m. "The Continuous Extrusion of Lead Cable-Sheaths." Dr. P. Dunsheath.

Scottish Centre.—Tuesday, December 8th. North British Station Hotel, Edinburgh. 7 p.m. "Lightning." Mr. B. L. Goodlet.

Hampshire Sub-Centre.—Wednesday, December 9th. University College, Southampton. 7.30 p.m. Twenty-seventh Kelvin Lecture. "The Transmutation of Matter by High Energy Particles and Radiations." Mr. J. D. Cockcroft.

Transmission Section.—Wednesday, December 9th. Institution, London. W.C.2. 6 p.m. "The Jointing and Terminating of High Voltage Cables." Mr. W. Holttum.

Dundee Sub-Centre.—Thursday, December 10th. University College, Dundee. 7.30 p.m. "Modern Aspects of Tele-Communication." Mr. W. S. Proctor.

Electrical Power Engineers' Association *(South Western Section).*—Tuesday, December 8th. South Wales Institute of Engineers, Cardiff. 6.30 p.m. Joint meeting with the Western Centre of the Institution of Electrical Engineers.

Illuminating Engineering Society.—Tuesday, December 8th. Institution of Mechanical Engineers, London, S.W.1. 7 p.m. "Low Voltage Neon." Mr. P. Freedman.

Association of Mining Electrical Engineers *(London Branch).*—Tuesday, December 8th. Junior Institution of Engineers, London, S.W.1. 6.30 p.m. "Remote Control of Haulages." Mr. S. W. Richards.

South Wales Branch.—Saturday, December 12th. Cardiff. Discussion on "H.M. Electrical Inspector's Report for 1935."

Royal Society of Arts.—Wednesday, December 9th. John Street, Adelphi, London, W.C.2. 8 p.m. "Artificial Resins." Mr. H. V. Potter.

Institute of Wireless Technology *(London and Home Counties Section).*—Thursday, December 10th. 4, Vernon Place, London, W.C.1. Debate on the straight circuit receiver *versus* the superheterodyne receiver. To be opened by Messrs. D. A. Griffith and R. H. Hacker.

Association of Consulting Engineers.—Friday, December 11th. Annual dinner.

Junior Institution of Engineers.—Friday, December 11th. Royal Society of Arts, London, W.C. 7.30 p.m. Presidential address by Sir William J. Larke. "Metallurgical Developments and Engineering Progress."

Notes

Electrical Engineers' Ball

As has been already announced here, this annual event will be held at Grosvenor House, Park Lane, W., on Friday, February 5th, 1937, the day after the annual dinner of the Institution of Electrical Engineers, as usual. The Ball will be organised on the same lines as last year and the times will be : 8.30 p.m. for 9 p.m. Supper 11.30 p.m. Carriages 3 a.m. There is an executive committee consisting of Messrs. W. G. Hendry, C. W. Hill, G. Laird, J. W. Leach, A. M. Sillar, J. W. J. Townley, and H. T. Young, but there is also a large general committee which includes the seven gentlemen already named and 77 others. We are asked to state for the information of the large number of ladies and gentlemen to whom the Electrical Engineers' Ball has become the principal social event of the year, that tickets (one guinea each) are now available and they can be obtained from any of the 84 members of the Committee. This Committee, by the way, includes the members of the Committee of the I.E.E. Benevolent Fund, under whose auspices the Ball is managed.

Scottish Electrical Engineers

The annual dinner of the Scottish Centre of the Institution of Electrical Engineers was held in Glasgow on November 24th, Mr. H. C. Babb, chairman of the Centre, presiding. Sir William J. Thomson proposed "The Institution," remarking that it represented one of the greatest industries, if not the greatest, in the country to-day. Every branch of trade, commerce and industry, and even the health was dependent on the electrical engineer. Mr. H. T. Young, president of the Institution, in reply, deplored that in the Glasgow guide book there appeared to be no section devoted to electricity but seven pages on gas. In regard to electrical progress, he said they must have the assistance of architects, for so many buildings when finished were found to be totally inadequate electrically for the service they had to fulfil. Mr. J. B. Mavor, past chairman of the Scottish Centre, proposed the health of the chairman.

Electrical Power Engineers' Dinner

The fourteenth annual dinner and dance of the West Yorkshire Section of the Electrical Power Engineers' Association was held at the Victory Hotel, Leeds, on November 27th, Mr. J. C. Welburn, chairman of the Section, presiding. Proposing "The Association," Mr. Morley New, Electricity Commissioner, said he felt sure the early members of the E.P.E.A. would look back with pride knowing that they had helped to form the National Joint Board, which had brought about reasonable conditions of employment and remuneration. Mr. J. F. Sarvent, president of the E.P.E.A., responded. Whist and dancing followed the dinner. There were about 230 people present.

Welded Joint Tests

The British Standards Institution has issued a specification (No. 709/1936) outlining standard methods of making a bend test on welded joints. Four forms of test have been provided for, two for determining the ductability of the metal in the joint and two for testing the joint as a whole, such as for adequate fusion of the weld metal with the parent metal and workmanship generally. Copies may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. post free.

I.E.E. (South Midland Centre) Students

The anual dance of the South Midland Students' Section of of Institution of Electrical Engineers will be held on December 11th, at Boot's Café, Colmore Row, Birmingham.

E.A.W. Activities

The inaugural meeting of the South Shields Branch of the Association took place recently, and it is proposed to start a new branch at Whitby, Yorkshire. Some fifty persons were present at the inaugural meeting of the Alderley Edge and Wilmslow Branch on November 26th, when addresses were given by the chairman, Mrs. W. L. Bragg, Mr. E. C. C. Evans, chairman of the Alderley Edge and Wilmslow Electricity Board, Mrs. Pender Chalmers and Miss Foster Jeffery. Officers were elected as follows :—President, Mrs. W. L. Bragg; vice-president, Mrs. V. Z. de Ferranti; chairman, Mrs. Ferguson; hon. treasurer, Mrs. Evans; hon. secretary, Mrs. Cameron Kirby; hon. magazine secretary, Mrs. Forrester.

The Harrogate and District Branch held its annual dinner on November 25th. "The Electrical Association for Women" was proposed by Professor E. L. E. Wheatcroft, M.A., professor of Electrical Engineering at the University of Leeds. Dr. Laura Veale responded.

Appointments Vacant

Electrical engineering assistants in the drawing office of the Air Ministry.

Boiler house engineer for Southampton Electricity Department.

Instrument maintenance engineer for Belfast Electricity Department.

Shift charge engineer for Leigh Electricity Department.

Contract estimating engineer and junior draughtsman for Fulham Electricity Department.

Chief clerk (electrical) for Worksop Corporation.

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

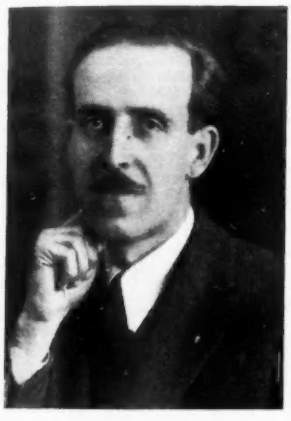
Sir Thomas Royden, Bt., has been appointed chairman of Edmundson's Electricity Corporation; **Mr. F. H. James** has been appointed vice-chairman, and **Brig.-General Wade H. Hayes** has been re-appointed managing director. **Sir Austen Chamberlain** has also been elected to a seat on the board.

Mr. A. W. Saulter, late sales manager of Croydon Cable Works, Ltd., has been appointed southern district manager for Warrington Electric Cables, Ltd. Communications for him should be sent to the office of the company at Selsdon Road, Croydon.

Mr. H. Pool, formerly manager of Leicester Passenger Transport Department, has been presented with a silver salver by members of the clerical and technical staff. Mr. J. Ellison, acting general manager, made the presentation.

Mr. E. C. Potts, B.Sc. (Eng), Grad. I.E.E., junior technical assistant in the Testing Department of the North Eastern Electric Supply Co., Ltd., has been appointed technical assistant in the Meter Department of the London and Home Counties Joint Electricity Authority.

Mr. B. F. Moffat, B.A.Sc., has been appointed a director of Moffats, Ltd. For many years he has been closely associated with technical matters relating to domestic electric cookers and refrigerators, and in this connection he has visited a number of countries.



Mr. B. F. Moffat

Mr. V. P. Kersley, who has been district engineer for the North-Eastern Electric Supply Co., Ltd., at Ashington, Northumberland, for seven years, has been appointed assistant superintendent at the company's headquarters at Carliol House, Newcastle. The staff at Ashington have presented him with a chiming clock.

Mr. J. Irving, for over twenty years manager of the Cable Department of the Greengate and Irwell Rubber Co., Ltd., and for the past eight years a director of Rotunda, Ltd., has relinquished his position and retired from business.

Mr. F. Polden, M.I.E.E., M.I.Mech.E., who is a Common Councillor of the City of London, has been elected chairman of the Coronation Decorations and Illuminations Committee for the City of London.

Mr. A. R. Fearnley, who retired from the position of general manager of the Sheffield Corporation Transport Department on November 24th, has been presented by the employés with a silver tea and coffee service. The presentation was made by Mr. J. Elder, vice-chairman of the Transport Department's club. Mr. H. C. Watson, assistant manager, who succeeds Mr. Fearnley, mentioned that Mr. Fearnley was the sole remaining foundation member of the Municipal Tramways Association.

Mr. A. Murray Coombs, consulting engineer, is moving to 6, Hanover Square, W.1 (Mayfair 2621). Among his recent activities he has been engaged as consulting engineer for the new West Sussex County Offices, Chichester, which were described in our November 20th issue.

The Hon. G. L. Parsons has been elected chairman, and **Mr. W. H. Pilmour,** managing director of Parsons Marine Steam Turbine Co., Ltd., in succession to the late Mr. R. J. Walker. Mr. Pilmour will also continue as secretary. **Mr. D. Somers Brown,** engineering manager, has been elected to the board of directors.

Mr. R. W. Bailey, of the Research Department of the Metropolitan-Vickers Electrical Co., Ltd., has had the degree of Doctor of Science conferred upon him by the University of London. Dr. Bailey has, for a number of years, been in charge of the mechanical, metallurgical, and chemical sections of the Research Department. Under his direction the mechanical and metallurgical sections have given particular attention to investigating the properties of metals at high temperatures. In this field his original work is of international standing, and it was upon the basis of his published work in this subject that the degree was conferred. His position as an authority upon the strength and behaviour of metals has been recognised by his appointment to a number of national committees dealing with this subject.

Dr. R. W. Bailey

Obituary

Mr. J. D. Dallas.—We regret to record the death of Mr. James Douglas Dallas, M.I.E.E., which occurred at his home in London on November 26th, in his seventy-third year. At the end of 1933 Mr. Dallas retired from the position of chief mains engineer to the County of London Electric Supply Co., Ltd., but was retained by the company in a consultative capacity. He was educated at University College, London, and before his association with the County of London Co., he was attached to the Edison General Electric Co., the Thomson-Houston Co., of America, and to the India Rubber, Gutta Percha and Telegraph Works Co., Ltd. He joined the County of London Co. as mains superintendent in January, 1895, and became the chief mains engineer in 1919. A service was held at Christ Church, Kensington, on Tuesday last, and the interment took place at Iver Heath Churchyard, Bucks.

The late Mr. J. D. Dallas

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Wyeside Welding & Electrical Co., Ltd.—Private company. Registered November 23rd. Capital, £5,000. Objects: To acquire the business of oxy-acetylene and electrical welding, electrical contracting, &c., carried on by J. W. Baker and H. T. Sutters, at 51, Whitecross Street, Hereford, as the Wyeside Welding and Battery Service Co. The permanent directors are: J. W. Baker, "Elstow," Lingen Avenue, Hereford, and H. T. Sutters, "Kenilworth," Westfaling Street, Hereford.

Radio Telefunken, Ltd.—Private company. Registered in Dublin on November 17th. Capital, £4,000. Objects: To carry on, develop and turn to account the business of wholesale and retail wireless radio and television merchants and distributors as formerly carried on by P. A. Curran and R. MacRaighalaigh, as Metro Radio, at 122a, St. Stephen's Green, Dublin. The directors are: R. MacRaighalaigh, 122a, St. Stephen's Green, Dublin, and two others.

Refrigeration (Birmingham), Ltd.—Private company. Registered November 23rd. Capital, £6,000. Objects: To carry on the business of manufacturers of and dealers in refrigerators and refrigerating apparatus of all kinds, &c. The permanent governing directors are: H. Garner, 50, St. Agnes Road, Moseley, Birmingham, and A. M. Allan, 132, Grove Road, Kings Heath, Birmingham. Registered office: 210, Broad Street, Birmingham.

Stoat Manufacturing Co., Ltd.—Private company. Registered November 26th. Capital, £5,000. Objects: To carry on the business of manufacturers of and dealers in insulated materials of all kinds, insulated wires, cables, flexible materials and bobbins of all kinds, electrical and radio accessories, &c. The permanent directors are: P. Stoat, Connaught Club, Marble

Arch, W.2, F. C. Langton, 66, Lake View, Canons Park, Edgware, and H. T. Bromley, address not stated.

Signeon, Ltd.—Private company. Registered November 23rd. Capital, £2,000. Objects: To acquire the business of illuminated sign contractor carried on by R. H. Haswell, at Templar Street, Leeds. The directors are: R. H. Haswell (permanent managing director), 7, Gledhow Park Crescent, Chapel Allerton, Leeds, 7, and two others. Solicitor: L. Altman, 4, Park Square, Leeds.

Wilfrid Langton, Ltd.—Private company. Registered November 24th. Capital, £1,000. Objects: To carry on the business of electrical decorators and engineers and contractors, heating and lighting engineers and contractors, &c. The subscribers are: W. B. Langton, Tudor House, Mellor Close, Banstead, and J. E. Byde, 81, Horncastle Road, Lee, S.E.12. W. B. Langton is the first director.

Gnome Electric Lamp Works, Ltd.—Private company. Registered November 26th. Capital, £10,000. Objects: To carry on the business of manufacturers of and dealers in electric lamps, electric-discharge tubes, X-ray valves and tubes, &c. The life directors are: M. A. Hassid, 21, Sloane Avenue, S.W.3, and F. Delbeke, Brimsdale, Tenterden Grove, Hendon, N.W.4. Registered office: Bassishaw House, 70a, Basinghall Street, E.C.2.

Amalgamated Relays, Ltd.—Private company. Registered November 13th. Capital, £500. Objects: To construct and maintain wireless signal and other stations, to receive wireless or radio signals or waves or programmes, to transmit and relay the same, &c. The directors are: H. Atkinson, 11, Harrison Street, Harle Syke, near Burnley, and six others. Registered office: 8, Standish Street, Burnley.

Hudsons Radilectels, Ltd.—Private company. Registered November 27th. Capital, £1,000. Objects: To carry on the business of manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, batteries, &c. The permanent directors are: S. Hole, Yew Tree House, Albourne, Sussex, A. E. Webster, 62, Dyke Road, Brighton, and H. J. S. Gilbert-Stringer, 4, Clifton Road, Brighton. Registered office: 56, Dyke Road, Brighton.

Returns of Electrical Companies

Midland Electric Corporation for Power Distribution, Ltd.—Particulars filed of debenture stock to secure £600,000 (inclusive of £300,000 already registered), authorised October 15th, 1936, and covered by trust deed dated November 2nd, 1936 (supplemental to trust deed dated December 31st, 1935) charged on various properties in the counties of Stafford and Worcester, and the company's other assets, present and future, including uncalled capital. The amount of the present issue is £300,000. Trustees: Electrical Finance and Securities Co., Ltd. (The whole of the £300,000 stock has been issued at 99⅜ per cent.)

English Electric Co., Ltd.—Satisfaction (1) to the extent of £601,400 on October 9th, 1936, of 5½ per cent. debentures secured by trust deed dated September 15th, 1919, and registered October 3rd, 1919, and (2) to the extent of £450,936 on November 13th, 1936, of 6 per cent. debenture stock secured by trust deed dated August 14th, 1923, and registered August 1st, 1924.

North Eastern Electric Supply Co., Ltd.—Satisfaction to the extent of £14,402 on July 2nd, 1936, of trust deed dated October 31st, 1930, and registered November 8th, 1930, securing £2,300,000 5 per cent. consolidated debenture stock; to the extent of £51,113 on July 15th, 1936, of trust deed dated December 30th, 1933, and registered January 17th, 1934, securing £2,500,000 3½ per cent. consolidated debenture stock; and in full on October 31st, 1936, of mortgage dated August 25th, 1919, and registered September 6th, 1919, securing £40,150.

Richmond (Surrey) Electric Light & Power Co., Ltd.—Capital £310,000 in ordinary shares of £1. Return dated April 14th (filed September 23rd), 1936. All shares taken up. £200,000 paid. £110,000 considered as paid. Mortgages and charges, nil.

Falconar Cross & Co., Ltd.—Satisfaction in full on October 31st, 1936, of mortgage dated August 22nd, 1931, and registered August 27th, 1931. (According to the register of mortgages the mortgage registered August 27th, 1931, originally secured £4,150 and any other sums to become due.)

Mortgage on 7 and 9, Ridley Place, Newcastle-on-Tyne, dated October 30th, 1936, to secure £5,000 and any further advances. Holders: Newcastle-upon-Tyne Permanent Building Society.

Page & Miles, Ltd.—Charge on 60, Western Road, and 43, Castle Street, Brighton, dated November 10th, 1936, to secure £12,000. Holders: General Electric Company, Ltd. Satisfaction in full on November 10th, 1936, of mortgage dated October 12th, 1927, and registered October 18th, 1927. (According to the register of mortgages, the mortage registered October 18th, 1927, originally secured £6,000.)

M. & W. (Radio & Electrical), Ltd.—Particulars filed of £20,500 debentures authorised October 27th, 1936, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

United Electric Tramways Co. of Caracas, Ltd.—Issue on September 25th, 1936, of £7,000 debentures, part of a series already registered.

Scott Insulated Wire Co., Ltd.—Particulars filed of £5,690 debentures, authorised November 13th, 1936, charged on the company's undertaking and property, present and future, including uncalled capital and book debts, the whole amount being now issued.

Associated Distributors, Ltd. (formerly Electrical Trading Association, Ltd.).—Charge on the company's undertaking and property, present and future, including uncalled capital, dated November 3rd, 1936, to secure all moneys due or to become due from the company to National Provincial Bank, Ltd.

Diamond "H" Switches, Ltd.—Capital, £3,000 in 3,000 shares of £1. Return dated September 21st, 1936. 2,000 shares taken up. £2,000 paid. Mortgages and charges nil.

City Notes

Crabtree Electrical Industries, Ltd.—The list opened on Wednesday last in an offer for sale by Dawnay, Day & Co. of 350,000 5 per cent. cumulative preference shares of £1 each at 20s. 6d. per share and 840,000 ordinary shares of 10s. each at 12s. 9d. per share in Crabtree Electrical Industries. The company was incorporated on November 21st to acquire the whole of the issued share capital of J. A. Crabtree & Co., Ltd., for £950,000 cash. The vendors have subscribed in cash for 359,993 ordinary shares at par. Dawnay, Day & Co. have subscribed in cash at 20s. 3d. for the preference and at 10s. 3d. for the ordinary, which are now being offered. Application on the terms of the offer has been made for 400,000 ordinary shares and will be accepted in full. J. A. Crabtree & Co., Ltd., was formed in 1919 by the late Mr. J. A. Crabtree to manufacture switches and other electrical installation accessories. The company's business expanded rapidly and the area now covered by its factories is six times greater than the building originally erected. Its products are widely protected both in this country and abroad by nearly 200 patents and over 150 registered designs.

The prospectus showed that the turnover for the year to July 31st, 1936, was the greatest in its history, and the turnover for the first three months of the current financial year shows a substantial increase over the corresponding period of the preceding year. Net profits have risen continuously from £70,370 for the year ended July 31st, 1932, to £152,008 last year. Allowing £3,000 for estimated administrative expenses of the new holding company the five-year average would cover the gross preference dividend (£17,500) nearly six times. The balance remaining would have been equivalent to over 14 per cent. on the £600,000 of issued ordinary capital, or about 11 per cent. on the price at which the shares are now offered. On the basis of last year's figures, the preference dividend is covered approximately 8½ times and the balance remaining is equivalent to nearly 22 per cent. on the issued ordinary capital, or approximately 17 per cent. on the price at which the shares are now being offered.

Electrical Switchgear & Associated Manufacturers, Ltd., held its first annual meeting on November 25th, when Mr. J. A. Hirst (chairman), who presided, in referring to the progress of Brookhirst Switchgear, Ltd., the operating company, said that they held the whole of the shares of that company. The present state of the order book of the operating company justified the opinion that the profits of the current financial year should not be less than those of the year under review. The turnover of the business continued in a sound fashion. It had been necessary already to extend the capacity of the works and plant, and a more comprehensive scheme of extensions was now under careful consideration. With regard to their scope as a holding company, they had not lost sight of this side of the "purposes" of the formation. They did not consider, however, that the time was opportune for further steps in this direction.

Increases of Capital.—The following companies have recently increased their capital to the extent shown:—Creed & Co., Ltd., from £110,000 to £150,000; Ringmer and District Electricity Co., Ltd., from £10,000 to £150,000; Westmorland and District Electricity Supply Co., Ltd., from £10,000 to £400,000; Dunoon and District Electricity Supply Co., Ltd., from £20,000 to £200,000. The last three companies are controlled by Johnson & Phillips, Ltd.

Crompton Parkinson, Ltd., report a profit for the year ended September 30th last of £353,858, as compared with £243,810 for the previous year, to which is added £63,430 brought in, making £417,288. It is proposed to place £224,963 to reserve and to pay a final dividend on the ordinary and "A" ordinary shares of 6½ per cent., making 12½ per cent. for the year (same), leaving £79,232 to be carried forward. It is proposed to capitalise out of general reserve the sum of £34,963 10s. to be distributed to holders of ordinary and/or "A" ordinary shares in the form of new "A" ordinary shares of 5s. each, fully paid, in the proportion of seven new shares for every 100 shares held. The general reserve account will thus be increased by £190,000 to £500,000. In addition, a special bonus issue will be made of one new "A" ordinary share for every ten ordinary and/or "A" ordinary shares held, the issue being made at the price of 30s. per share.

We have received an advance copy of the speech which Mr. F. Parkinson, the chairman, is to deliver at the annual meeting to be held on December 11th. Mr. Parkinson says that the year's results are in part a reflection of the fact that the company has achieved the largest total of sales in its history, but also to the fact that in all their factories they have this year reached new and higher levels of efficiency of production. The factories are working to full production and they commence a new financial year with an order book considerably in excess of last year. The progressive development of the electrical manufacturing industry is bound up with the maintenance of peace in world affairs and it is to an improvement in the facilities for world trade that we must look for a permanent expansion of our markets. Whilst the company has every reason to believe that it is meeting the needs of the home market, it has not neglected to consider the future of the markets overseas and is able to record a satisfactory expansion of export turnover. An extension of the cable works at Derby has been decided upon which will enable the company to reduce the costs of production still further. There has been a heavy increase in the demand for their cables. The subsidiary company, the British Electric Transformer Co., Ltd., has experienced a large demand for its products to meet the home market requirements, and in addition an appreciable proportion of the production capacity is being utilised to deal with overseas demands.

The production capacity of Crompton and Kye lamps has been again considerably increased during the year, and in order to meet the future requirements of this section of the business new works are being erected. The plans include a large research laboratory which will enable the company more adequately to undertake research work in connection with the development of new types of lamps. The litigation instituted against the company for alleged infringement of lamp patents is still pend-

ing and there has been no substantial change in the position. The subsidiary company—Atlas Sprinkler Co., Ltd.—continues to make satisfactory progress, and contracts now in hand, at home and abroad, are more than double the value of those at this time last year. Their electric traction equipment has established a favourable reputation and the outlook in this section of the business is satisfactory. During the year further extensions of the benefits to eligible employés under the superannuation and benevolent funds have been made. Every male employé can now qualify for a life pension at the age of sixty up to half his salary or wage. Previously the retiring age was sixty-five. The special issue will result in the company receiving approximately £300,000 in cash which will enable it to finance necessary new capital expenditure in connection with its expansion programme without reducing the liquid capital of the business.

The British Electric Transformer Co., Ltd., reports a net profit for the year ended September 30th last of £52,106, as compared with £47,342 in the preceding year. The final ordinary dividend is 1s. per share, tax free, making 2s. 1½d. for the year, and £1,683 is carried forward. The report states that there has been a satisfactory increase in the volume of business obtained for transformers. The directors have issued a further 360,000 ordinary shares of 5s. each at par for cash.

Enfield Rolling Mills, Ltd., held its annual meeting on November 27th, when the Earl of Verulam (chairman), who presided, said that last year the board had taken what proved to be an over-optimistic view of the prospects. He referred to the accounts, and said that the profit of £9,136 (after meeting various charges there was an adverse balance of £25,860) was chiefly from the zinc rolling mill, the rod rolling mill and the copper and brass refinery. The rod mill had rolled a record number of tons last year, and in the zinc mill they had doubled the output of the previous year, while the costs there were more favourable. The refinery had also done well. There had been a complete change of management in the copper and brass sheet rolling mill, but six months of the current year would have gone by with the plant working at a loss. In the following six months the plant should work at a profit, although they estimated a small loss on that department at the end of the current year. This department should make a profit in the year ending September, 1938. If the other departments continued the past two years' improvement there should be a profit on the whole business next year, and they hoped to eliminate the adverse balance of £75,000 by the end of 1938.

S. Smith & Sons (Motor Accessories), Ltd.—Presiding at the annual meeting held on November 26th Mr. W. Henderson-Cleland (chairman) spoke of the considerable progress made. He said that there had been an increase in all departments, and they had experienced a record turnover and profit. With regard to the clock group, this had been consolidated in a company entitled S. Smith & Sons (1934), Ltd., with a capital of £300,000. The business of this group had increased during the year, particularly in synchronous electric clocks. The sale of English clocks by their companies at the present time was equal to 50 per cent. in value of the total imports from abroad.

The Ever Ready Co. (Gt. Britain), Ltd., offers to acquire the £500,000 of preference stock of Lissen, Ltd. Four Ever Ready 5s. ordinary shares (to be converted in due course into stock units) are offered for five Lissen preference stock units of £1. The offer is subject to acceptance by holders of not less than 90 per cent. in value of the Lissen stock, or such lesser amount as the Ever Ready Co. may decide to accept. The Ever Ready Co. already owns the whole of the ordinary capital of Lissen with the exception of a small holding retained by the original owner and vendor.

W. T. Henley's Telegraph Works Co., Ltd.—An extraordinary meeting was held on December 1st at which resolutions were adopted modifying the articles of association; increasing the capital from £1,000,000 to £1,500.000 by the creation of 500,000 ordinary shares of £1 each; providing for the conversion of the issued capital from shares into stock; and authorising the capitalisation and distribution of £650,000 undivided profits.

R. A. Lister & Co., Ltd., report a net profit for the year ended September 30th last of £167 295, as compared with £112,678 in the preceding year, to which is added £58,805 brought in, making £226,100. From this the following allocations have been made:—Provision for taxation, £41,567; commission due to directors and staff bonus, £21,835; provision for additional pensions reserve, £10,000; and provision towards building new foundry, £17,000. It is proposed to pay a final ordinary dividend of 5 per cent., and a bonus of 6 per cent., making the total distribution for the year 16 per cent., and to carry forward £62,176.

Turner & Newall, Ltd., in a preliminary statement, report a net profit for the year ended September 30th last of £1.163.308, as compared with £780.625 in the preceding year, to which is added £94.548 brought in making £1.257.856. The final ordinary dividend is 13⅜ per cent., less tax, making 17½ per cent. (against 12½ per cent.), the staff pension fund receives £10.000, and general reserve £200.000. The balance carried forward is £99.069. The new shares which were issued last August to stockholders on bonus terms do not rank for dividend now announced.

The Associated Equipment Co. reports a trading profit for the year ended September 30th of £333.603 which, with other income (£6,577) and £244,432 brought in, makes £584.612. A sum of £60.000 is allocated to tax reserve, depreciation absorbs £69,578, and reserve receives £85,000. The dividend for the year on the £1,500,000 stock is 9 5/6 per cent., and £255,000 is carried forward.

The Barbados Electric Supply Corporation is holding an extraordinary meeting on December 21st, at which a resolution will be submitted for increasing the capital to £200.000 by the creation of 100.000 additional ordinary shares of £1 each. It is also proposed to capitalise £20.000, part of the general reserve, and to distribute 20.000 ordinary shares of £1 each to ordinary shareholders *pro rata* to their holdings.

Broom & Wade, Ltd., have declared a final dividend of 15 per cent. on the ordinary shares, making 20 per cent. for the year. For the initial accounting period to September 30th, 1935, a dividend of 10 per cent. per annum was paid. In July last the issued ordinary capital was increased.

Yarrow & Co., Ltd., report a net profit of £36,329 for the year ended June 30th last, as compared with £30,680 for 1934-35. Reserve receives £15,000, and the dividend for the year is 10 per cent. (same), plus a cash bonus of 5 per cent. The balance carried forward is £23,514.

The Revo Electric Co. is paying an interim ordinary dividend of 5 per cent., actual, less tax. Last year's interim was 5 per cent., tax free, and was equal to approximately 2.6 per cent, less tax, on the present issued capital.

Ruths International Accumulators.—The accounts for the thirteen months to January 31st show an ordinary revenue of £5,735, from which is deducted expenses (£4,370), leaving a balance of £1,365. To this is added £74, special credits, making £1,439 available. It is proposed to transfer the whole of this to reserve for investments in and loans and advances to subsidiary companies account.

The Jerusalem Electric & Public Service Corporation proposes to increase its capital from £P.500,000 to £P.600,000 by the creation of 100,000 shares of £P.1 each.

The India Rubber, Gutta Percha & Telegraph Works Co., Ltd., reports net profits for the year ended September 30th of £66,137, as compared with £51,185 for the previous year.

The Burma Electric Supply Co. reports a net profit for the year ended July 31st, after transferring £5,000 to reserve and depreciation fund, of £9,623, as compared with £8,731 in the preceding year, to which is added £10.628 brought in. A dividend of 1½ per cent. is paid on the ordinary shares (against nil) and £11,251 is carried forward.

The General Cable Manufacturing Co. has announced a final dividend on the ordinary shares of 5 per cent., making 10 per cent. for the year (same).

The British Columbia Power Corporation has announced a quarterly dividend of 40 cents on the class "A" shares (against 37 cents a year ago).

Edmundsons Electricity Corporation, Ltd., has declared an interim dividend of 4 per cent (against 3½ per cent.).

The Globe Telegraph & Trust Co., Ltd., is paying a quarterly dividend of 2s. per share, net.

Stocks and Shares

TUESDAY EVENING.

STOCK Exchange markets have entered upon the last month of the year with a fair amount of confidence, but with a lesser volume of business than that to which they have lately been accustomed. The monetary position remains unclouded. Cheap money seems to be assured for a long time to come. Gilt-edged stocks are in demand and the appetite for gilt-edged industrials gives little indication of more than a seasonal slackening.

Abroad, the outlook is far from being settled, with the result that people in this country turn to domestic investments as offering safety, with the possibility of increase in capital value. New issues continue to be offered to the public at a rate which makes it a matter for some surprise that they are, as a rule, so readily supported. The ready absorption of these new securities adds testimony, of course, to the fact that money still finds it difficult to secure profitable employment.

Walsall Conduits shares happened to strike an unpropitious day on which to make their bow in the market, but, in spite of rather depressing conditions last week, the reception was warm enough to suggest that the shares will be a popular addition to the electrical equipment list. The 4s. ordinary shares, issued at 32s. 6d., and the £1 5 per cent. preference, issued at 20s. 6d., each opened with a premium of 1s., but the premium on the ordinary quickly evaporated under the influence of sales by "stags," leaving the quotation at the issue price. The latter is more than eight times the nominal value of the shares, but net profits, according to the prospectus, are likely this year to be equivalent to over 66 per cent. on the ordinary capital and to cover payment of the preference dividend eleven times over.

Another newcomer is Crabtree Electrical Industries. An issue of preference and ordinary shares was made this week, the former on the same terms as Walsall Conduits preference, and the ordinary, of 10s. each, at 12s. 9d. There was something of a rush for the shares. At least one firm was said to have applied for the whole of the ordinary shares offered.

Electricity Supply Issues

The market for home electricity supply shares still lacks animation: price changes are very few, the most noticeable movement being a drop of ¼ in Midland Electric Power shares, which are now 41s. 3d. Recent statements by the Minister of Transport on the subject of conditions governing electricity supply are generally interpreted in the market as meaning that no action is at present contemplated along the lines suggested by the McGowan Committee's report. At the time when the recommendations were made the suggestion of a compulsory merging of the smaller supply companies into the larger was regarded as likely only to accelerate an existing movement. Electrical Distribution of Yorkshire, at 46s., are ex-rights to the new preference issue.

A block of Midland Counties ordinary shares is on offer, at the moment, at a price of 40s. 3d. per share. Profits earned by the company have a progressive trend; the ordinary shares received 7½ per cent. for 1935, as compared with an annual 7 per cent. for many years previously. The balance sheet

shows combined reserves amounting to nearly £360,000. The ordinary capital is three million pounds.

Edmundsons

Interest in Edmundsons Electricity Corporation has become more widely spread since the repatriation deal of a few months ago. Some 2,700,000 shares crossed the Atlantic at that time; of these, 800,000 have been marketed here, leaving 1,900,000 still privately held. The increase in this year's interim dividend from 3½ per cent. to 4 per cent. will, therefore, be welcomed as giving authoritative support to the view, previously taken here, that dividends for the whole of the current year will total 9 per cent. against the previous 8 per cent. The discounting of an increase in the interim dividend was mainly responsible for the absence of any response to the announcement in the price of the shares, which remains at 45s. If dividend expectations are fulfilled at the end of this year the yield on Edmundsons, at to-day's price, will be exactly 4 per cent.

Electrical Equipment Shares

Prices in the electrical equipment market are still disposed to droop, but they have stood up very well on the whole against the uncertainty engendered by the state of affairs in Europe and elsewhere. General Electrics have, indeed, risen 1s., and Associated Electricals remain unchanged on balance at 52s., although the quotation dipped at one time to 50s. The cables group is generally steady, except in the case of Johnson & Phillips, which fell from 51s. 3d. to 48s. 9d. General Cables reacted to 9s. after a sharp rise to 10s. 6d. English Electric issues suffered to some extent, but the ordinary, having lost 1s., to 24s. 6d., rebounded to 26s.; the preference fell 1s. 6d. to 27s. In the telephone section, Ericssons and Telephone Manufacturing are down to 55s. and 10s. respectively. The Enfield Rolling Mills meeting served only partially to check offering of the shares, which declined a further 1s. 6d. in price, to 15s. Other shares to reflect the prevailing tendency were Chloride Electrical Storage, now 95s. 9d., ex-dividend, Switchgear & Cowans 19s., Lancashire Dynamo 3⅜, and Allen Wests 7s. 3d. Electrical Switchgear eased to 29s. despite the satisfactory statements made at the annual meeting.

Crompton Parkinson

The Crompton Parkinson report, remarkably good though it is, failed to satisfy the super-sanguine, who turned out their shares in sufficient numbers to reduce the price of the shares from 85s. to 78s. 9d. There is no doubt that some people had been asking the practically impossible of Crompton Parkinson profits; estimates have been running as high as half a million pounds. The actual net figure of £354,000, which is £110,000 above last year's record level, is well up to the more reasonable expectations of the majority. The 12½ per cent. ordinary dividend and 7 per cent. free scrip bonus are repetitions of last year's distributions, when a free share bonus of 100 per cent. was given additionally. The latter is replaced this year by an offer to shareholders of one new share at 30s. for every ten held. With the market price at 80s., rights to the new shares are worth approximately 50s. per share to existing holders. To the company the new issue represents an addition of £300,000 to its resources. It might not be very far of the mark to guess that the actual profits are higher than those disclosed by the published figures.

Yield Considerations

Calculation of the yield on Crompton Parkinson shares is, of course, complicated by the customary methods of distributing profits. Calculated on the plain dividend rate the return is negligible; the £62,000 required for payment of this year's dividend, although £33,000 higher than was called for by similar payment on last year's smaller capital, still leaves £248,000 available for distribution to ordinary shareholders. The relationship between earnings and market share valuation is, therefore, the yardstick by which to take the measure of the latter. Gross profits, less preference dividend charges, for the past year were equivalent to 68 per cent. on the issued ordinary capital. Taking the present price of the shares at 69s. 9d., ex all this year's disbursements, the earnings yield works out a little under 5 per cent., indicating plenty of confidence in the company's ability to maintain the present rapid rate of progress.

Miscellaneous Matters

Prices of Cable and Wireless stocks, always sensitive barometers to prevailing world conditions, are depressed by the international atmosphere. The ordinary stocks show losses of 1¼, to 19½, in the "A," and ⅛, to 6¼, in the "B." The preference also is dull at 101¼.

London Transport "C" stock again came on offer; continuance of the flow of small realisations by Tillings shareholders of their allotments in respect of the recent offer of "C" stock has helped to depress the price to 96. Weakness is shown by British Electric Traction issues; the deferred lost 50 points, falling to 1625, and the preferred is 2 points lower at 177½. Baird Televisions gave way on the fire at the Crystal Palace, but the loss was partially recovered. Electric and Musical shares are unaltered at 23s. 6d. The iron and steel group shows a firmer front. Rubber shares maintain their last week's attitude of waiting.

Share List of Electrical Companies

	Dividend. Nom.	Previous.	Last.	Price. Dec. 1.	Rise or Fall.	Yield. p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	77/6	—	3 17 3
City of London	1	7½	7½	37/–	—	4 1 1
Clyde Valley	1	7	8	45/6	—	3 9 7
County of London	1	10½	10½	54/–	—	3 17 9
Edmundson's 7% Pref.	1	7	7	36/–	—	3 17 9
Do. Ord.	1	8	8	45/–xd	—	3 11 1
Elec. Dis. Yorkshire	1	9	9	46/–	–1/6	3 18 3
Elec. Fin. and Securities	1	12½	12½	3½	—	4 0 0
Elec. Supply Corporation	1	11	11	58/3	—	3 15 7
Lancs Light and Power	1	7½	7½	38/6	—	3 18 0
Lond. Assoc. Electric	1	—	7	35/–	—	4 0 0
London Electric	1	7	8	40/–	+6d.	4 0 0
London Power Deb. Red.	Stock	5	5	107½	—	4 13 0
Metropolitan	1	10	10	50/6	—	3 19 3
Midland Counties	1	7	7½	40/–	—	3 15 0
Mid. Elec. Power	1	8	8	41/3	–⅛	3 17 7
North Eastern Electric Ordinary	1	6	6	33/–	—	3 12 7
Do. 7% Pref.	1	7	7	36/–	—	3 17 9
Northampton	1	10	10	51/3	—	3 18 2
Notting Hill 6% Pref.	10	6	6	14½	—	4 4 3
North Met. Elec. Ordinary	1	10	10	55/–	—	3 12 9
Do. do. 6% Pref.	1	6	6	32/–	—	3 15 0
Scottish Power	1	8	8	41/–	—	3 18 2
South London	1	7	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	23/6	—	6 7 8
Yorkshire Elec.	1	8	8	44/–	—	3 12 9
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	120	—	4 3 5
Do. 1955–75	„	5	5	122	—	4 2 0
Do. 1951–73	„	4½	4½	115	+1	3 18 3
Do. 1963–93	„	—	3½	104	—	3 7 4
London Elec. Trans. Gtd.	„	—	2½	94½	+½	2 13 0
London & Home Counties, 1955–75	„	4½	4½	116	—	3 17 7
London Passenger Transport, A.	„	—	4½	125xd	+½	3 12 0
Do. do. B.	„	—	5	127xd	—	3 18 9
Do. do. C.	„	3½	4	96	–2	4 3 4
West Midlands Joint Elec. 1948–68	„	—	5	116½	—	4 5 10
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	190½	+3	4 14 6
Anglo-Am. Tel. Pref.	Stock	6	6	129½	—	4 12 8
Do. Def.	„	1½	1½	31	+½	4 16 9
Cable & Wireless 5½% Pref.	„	4½	5½	101½	–½	5 8 5
Do. A. 7½% Ord.	„	Nil	Nil	19½	–1½	—
Do. B. Ord.	„	Nil	Nil	6½	–⅛	—
Globe Tel. & Tel. Ord.	10	3½*	4½*	14½xd	+2/–	3 3 9
Do. Do. Pref.	10	6	6	14½xd	—	4 3 6
Great Northern Tel.	10	20	20	47	—	4 5 1
Marconi-Marine	1	10	7½	36/9	+9d.	4 1 8
Oriental Telephone Ord.	1	12*	12*	3⅛	—	3 12 6
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	5/9	—	—
Do. do. 2nd Pref.	5	Nil	Nil	5/–	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	21½	—	—
British Electric Traction Df. Ord.	„	5	5	1625xd.	–50	—
Do. do. Pref. Ord.	„	8	8	177½	–2	4 10 2
Brazil Traction	100	—	30 cts.	18¾	+⅛	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	104½	—	4 15 8
Mexican Light Common	100	Nil	Nil	3½	—	—
Do. 1st Bonds	$500	5	5	47	—	—
Victoria Falls Ord.	1	20	12	75/–	–⅛	3 4 0
West Riding	1	5	6½	50/–	—	2 12 9
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	62/6	—	4 16 1
Assoc. Elec. Ord.	1	6	8	52/–	—	3 1 6
Do. Pref.	1	8	8	39/6	—	4 1 0
Babcock & Wilcox	1	8	8	50/–	—	3 4 0
British Aluminium Ord.	1	7½	7½	44/3	—	3 7 10
British Insulated Ord.	1	15	20	6	—	3 6 8
Brush Ord.	Stock	Nil	Nil	42½	—	—
Callender's	1	15	15	4⅛	—	3 4 8
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/–	—	12½	3 19/32	–1/32	—
Do. 8% Pref.	1	8	8	2	—	4 0 0
Electric Construction	1	3½	7	42/6	—	3 5 9
Enfield Cable Ord.	1	25	25	5⅜	–1/32	4 9 0
English Electric	1	Nil	Nil	26/–	+6d.	—
Do. Do. Pref.	1	Nil	Nil	27/–	–1/6	—
Ericsson Tel.	5/–	24	20*	55/–	–1/32	1 16 4
Ever Ready	5/–	35	35	30/–	+6d.	5 16 8
Ferranti Pref.	1	7	7	28/9	—	4 17 5
G.E.C. Pref.	1	6½	6½	34/–xd	–3d.	3 16 4
Do Ord.	1	10	15	93/–	+1/–	3 4 3
Henleys	1	30	30	8⅜	—	3 8 6
Do. 4½% Pref.	5	4	4½	5⅜	—	3 18 3
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	7½	10	48/9	–⅛	4 2 0
Lancashire Dynamo	1	5	10	3⅜	–1/32	2 19 0
Siemens Ord.	1	4	6	33/9	—	3 11 2
Telegraph Construction	£1	Nil	Nil	35/–	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be numbered and abridged and all subsequent proceedings will be taken.

1935.

458. "Process and apparatus for the production of Röntgen rays of great penetrating capacity." S. Erdos and J. Bittera. February 5th, 1935. (Convention date not granted.) (456268.)

3043. "Electrical starting devices for internal-combustion engines." Mainud Starter, Ltd., H. O. Burge and R. J. Mogridge. January 30th, 1935. (Cognate applications 3969/35 and 3970/35.) (456056.)

9536. "Electro-therapeutic appliances." C. R. Oliver. March 27th, 1935. (456090.)

9714. "Circuits for use with thermionic valves." F. G. Frost and Halcyon Radio, Ltd. March 28th, 1935. (456062.)

10395. "Television and like transmitting systems." A. D. Blumlein and E. A. Nind. April 3rd, 1935. (456135.)

10413. "Directional wireless aerial systems." E. L. C. White and W. S. Percival. April 3rd, 1935. (456136.)

13213. "Electro-magnetic vibrating systems." C. S. Weyandt. December 20th, 1934. (456339.)

13219. "Electric cable systems." Okonite Co. June 23rd, 1934. (456340.)

13221. "Scanning oscillators for use in television and like systems." J. R. H. Forman and Baird Television, Ltd. May 3rd, 1935. (456138.)

13289. "Electrical condensers." Radio Condenser Co. May 9th, 1934. (456146.)

13351. "Electrical signalling systems." Automatic Electric Co., Ltd., G. A. Burns and T. R. Rayner. May 4th, 1935. (456218.)

13355. "Permanent magnets." Turton Bros. and Matthews, Ltd., and G. Thompson. May 4th, 1935. (456154.)

13428. "Electric inductances." General Electric Co., Ltd., and J. Cates. May 7th, 1935. (456347.)

13585. "Tuning-indicators." General Electric Co., Ltd., and R. W. Speirs. May 8th, 1935. (456360.)

13706. "Systems of electric motor control." British Thomson-Houston Co., Ltd. May 9th, 1934. (456221.)

13707. "Electric transmission and distribution systems." British Thomson-Houston Co., Ltd. May 9th, 1934. (456222.)

13970. "Electric cables." Pirelli-General Cable Works, Ltd., and J. L. Bishop. May 13th, 1935. (456071.)

14680. "Telephone or like contact plugs and their manufacture." Ericsson Telephones, Ltd., S. H. D. Ward and E. Bland. May 20th, 1935. (456159.)

14734. "Dynamo-electric power machines of which the field core is formed of permanent magnet steel." Siemens-Schuckertwerke Akt.-Ges. May 19th, 1934. (456373.)

15825. "Annunciators or table indicators." C. F. Gaunt. May 31st, 1935. (456073.)

16648. "Detecting circuits for radio receiving systems." H. Maeda. August 13th, 1934. (456074.)

17453. "Electrically heated chicken brooders." J. Bee. June 18th, 1935. (456172.)

18126. "Time bases for television receiving apparatus." E. Reader and L. Glass. June 25th, 1935. (456288.)

18492. "Electric circuit-breakers." G. E. Crabtree, W. T. Elliott, E. Badham and R. W. Thornton (legal representatives of J. A. Crabtree, decd.). June 28th, 1935. (456379.)

20791. "Type-printing telegraphs and other remote-control systems." International Business Machines Corporation. July 26th, 1934. (456383.)

20873. "Clock-operated electric switches." H. J. Osborn and W. Sharp. July 23rd, 1935. (456384.)

23298. "Luminous electric-discharge lamps." General Electric Co., Ltd. (Patent-Treuhand Ges. für Elektrische Glühlampen). August 19th, 1935. (456184.)

23859. "Trolley wires." T. H. Hurst. August 26th, 1935. (456186.)

25870. "Controlling systems for lifts." General Electric Co., Ltd., and N. C. Smart. September 18th, 1935. (456191.)

28364. "Distribution networks." E. Allstädt. October 14th, 1935. (456237.)

30244. "Electrolytic deposition of lead peroxide." Y. Kato. December 20th, 1934. (Cognate application 30245/35.) (456082.)

30913. "Piezo-electric device." C. E. Semple, Jun. November 8th, 1935. (456390.)

31414. "Electric control systems for elevators." Westinghouse Electric and Manufacturing Co. November 13th, 1934. (456296.)

32676. "Electrically driven locomotives." F. Whyman and Metropolitan-Vickers Electrical Co., Ltd. November 25th, 1935. (456197.)

34203. "Device for packing the active material in the electrodes of galvanic cells." Britannia Batteries, Ltd. December 10th, 1934. (456393.)

34895. "Electric welding systems." British Thomson-Houston Co., Ltd. Dec. 20th, 1934. (456394.)

35345. "Thermionic amplifiers for electromagnetic waves." Standard Telephones & Cables, Ltd. January 22nd, 1935. (456301.)

35946. "Apparatus for filling batteries and other containers." Koehler Manufacturing Co. December 28th, 1934. (456198.)

1936

772. "Electric control means for power-driven machines." Igranic Electric Co., Ltd. January 10th, 1935. (456303.)

3231. "Arc lamps." Opticolor Akt.-Ges. February 1st, 1935. (Cognate applications 3232/36 and 3233/36.) (456204.)

3809. "Permanent-magnet dynamo-electric machines." British Thomson-Houston Co., Ltd. February 7th, 1935. (456206.)

3934. "Single-phase mercury-vapour rectifier valves." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 30th, 1935. (456243.)

5137. "Gaseous-discharge lamps." Electrical Research Products, Inc. March 9th, 1935. (456402.)

5891. "Modulated carrier-wave signalling systems." Hazeltine Corporation. March 22nd, 1935. (456100.)

5897. "Electric-discharge lamp-circuits." British Thomson-Houston Co., Ltd. February 28th, 1935. (456250.)

6258. "Grids for use in electron-discharge tubes." Farnsworth Television, Inc. March 13th, 1935. (456102.)

6295. "Electrolytic condensers." Hydrawerke Akt.-Ges. and Dr. G. Nauk. March 2nd, 1936. (456254.)

6827. "Methods and apparatus for determining distance by means of radio energy." Telefunken Ges. für Drahtlose Telegraphie. March 6th, 1935. (456104.)

8385. "Telegraph systems." Standard Telephones & Cables, Ltd. April 4th, 1935. (456108.)

8527. "Electrical contactors." British Thomson-Houston Co., Ltd. March 21st, 1935. (456263.)

9283. "Electric butter-softener for domestic use." A. W. K. Dickinson and F. Steven. March 28th, 1936. (456109.)

9955. "Kerr cells." J. Bell and W. S. Worthington. April 3rd, 1936. (456112.)

11004. "Modulated carrier-wave communication systems." J. M. D. Dekker. April 30th, 1935. (456270.)

11033. "Electric signal transmission systems." Standard Telephones & Cables, Ltd. May 16th, 1935. (456116.)

13928. "Tubes for converting an optical image into an electron image, especially for picture decomposition." W. Heimann. May 20th, 1935. (456316.)

14322. "Electric motor control systems." British Thomson-Houston Co., Ltd. May 22nd, 1935. (456123.)

15643. "Electric switches with arc-quenching means." Electrical Apparatus Co., Ltd., and R. H. Barbour. June 4th, 1936. (456125.)

16182. "Acoustical apparatus." N. P. R. Jarnak. June 12th, 1935. (456414.)

17868. "Devices for inserting granular insulating masses in electric tubular heaters." Siemens Schuckertwerke Akt.-Ges. June 29th, 1935. (Addition to 446588.) (Cognate application 17869/36.) (456323.)

18011. "Methods of and apparatus for electric welding." British Thomson-Houston Co., Ltd. June 27th, 1935. 456130.)

18169. "Luminous-discharge lamps." Corning Glass Works. January 8th, 1936. (456325.)

18401. "Electric welding." British Thomson-Houston Co., Ltd. July 2nd, 1935. (456326.)

19788. "Installations comprising gas-filled electric-discharge tubes." Naamlooze Vennootschap, Philips' Gloeilampenfabrieken. July 19th, 1935. (456132.)

25754. "Braun tubes preferably for television purposes." Radioakt.-Ges. D. S. Loewe. March 31st, 1934. (Addition to 423427.) (Divided out of 6689/35.) (456331.)

26637. "Circuits associated with the deflecting systems in cathode-ray tubes, preferably for television purposes." Radioakt-Ges. D. S. Loewe. May 9th, 1934. (Addition to 423427.) (Divided out of 13525/35.) (456208.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 25th.

AL (lettering and design). No. 567331. Class 6. Machinery of all kinds and parts of machinery.—The Electric Auto-Lite Co., Toledo, Ohio, U.S.A. (British representatives, Marks & Clerk, 57-58, Lincoln's Inn Fields, W.C.2).

Decelite. No. 572175. Class 40. Goods manufactured from indiarubber and guttapercha.—Durham Cables, Ltd., Birtley, County Durham.

Paranite. No. 571002. Class 50. Adhesive textile tape impregnated with indiarubber for sealing containers and electrical insulation, &c.—Rotunda, Ltd., 260, Manchester Road, Denton, Lancashire.

Coal Research

THE annual report of the Fuel Research Board for the year ended March 31st, 1936, issued by the Department of Scientific and Industrial Research (H.M. Stationery Office, 4s. net), refers to the increased efficiency in the use of coal during the last few years which has resulted in striking reductions in consumption, although the total energy obtained from the coal and usefully applied has increased. The amount of coal cut by machines has increased from 23 to over 45 per cent. of the total output and the amount in small sizes cleaned by washing or dry processes has increased in the same period from 20 to 40 per cent. of the output. Coal is now regarded as a raw material which requires processing before being offered for sale and this change in mining practice is having a considerable influence on the programme of work of the Fuel Research Station and the nine Coal Survey Laboratories, situated in the various coalfields.

The report states that a reduction in the number of grades will simplify the selling of coal and the Board welcomes the appointment of a committee by the Midland Institute of Mining Engineers and the South and West Yorkshire Coal Owners' Association to investigate the matter. Considerable attention has been paid to the mixing or blending of coal from different seams, for there are already signs of a shortage in first-class coking smalls.

In connection with the conversion of tar into motor spirit and fuel oils, experience has been gained which would enable a simple large scale plant to be designed if required. In the use of pulverised fuel for steam raising, good results are being obtained both in the industrial plants at the station and in commercial plants, with the pulverised fuel grid-burner developed by the station and the device for dividing a stream of air-borne pulverised fuel into two equal parts for supplying two furnaces.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldershot.—Extension to isolation hospital (£27,708); R. Holford & Co., builders, Guildford.

Amble (NORTHUMBERLAND).—Houses (36), Acklington; J. W. Urpeth, builders, Bedlington.

Amersham.—Houses (75); R.D.C. surveyor.

Bath.—Houses (98) and fire station (£26,702); city surveyor.

Bexhill-on-Sea.—Houses (20), Willingdon Avenue; Bexleigh Estates, Ltd.

Billericay.—Houses (32) and Council chamber and offices (£15,000); U.D.C. surveyor.

Birkenhead.—School, Prenton, for Borough E.C.; director of education. School, Upton, for E.C.

Birmingham.—Factory, Weston Lane, for Messrs. Woodyatt, Bishop Street; H. Johnson, builders, Grange Road.

Blackpool.—Factory, Chiswick Grove, Preston New Road, for Knowlsons, Ltd.; H. Best, architect, 20, Clifton Street.

Bolton.—Cinema, Ashburner Street; Odeon (Bolton), Ltd.

Brecknockshire.—School, Crickhowell, for County E.C.; director of education, County Offices, Brecon.

Bristol.—Houses (126), Southmead estate; H. W. Webb, surveyor, Housing Dept., 51, Prince Street.

Burton-on-Trent.—Factory, for J. Tavener and Sons, Ltd., Burton-on-Trent.

Bury (LANCASHIRE).—Houses (300); borough surveyor.

Cockermouth.—Houses (50), Windmill Lane housing estate; H. Oldfield, architect, St. Nicholas Street, Workington.

Coventry.—Factory (20-acre site), for Rudge-Whitworth, Ltd.

Darlington.—Municipal offices, Feethams (£90,000); borough engineer.

Devonshire.—Schools, Torrington, for County E.C.; director of education, Exeter.

Dudley.—Houses (248), Rosland estate (£80,680); Henry Boot & Sons, Ltd.

Dukinfield.—Houses (88), King Edward VIII estate; borough surveyor.

Dundee.—Houses (72), Polepark works' scheme; D. B. McLey, 91, Commercial Street.

Durham.—School, Kibblesworth, for County E.C.; F. Willey, county architect, 34, Old Elvet, Durham.

Enfield.—Houses (80), Chester Gardens; G. W. Newman. Houses (40), Collinwood Avenue; W. Goodchild & Co. Houses (49), Elmore Road; Hamilton, Son & Campion. Houses (66), Westmoor Road; W. M. Edwards. Factory, Millmarsh Lane; Griggs & Son. Ice rink and dance hall, Eaton Road; Savoy Cinema Co.

Essex.—School, Lawford, for County E.C.; director of education, Chelmsford. Rebuilding Cressing School (£26,613) for County E.C.; J. Stuart, county architect, Chelmsford.

Folkestone.—Civic centre; borough engineer.

Garstang (LANCASHIRE).—Houses (22); R.D.C. surveyor.

Gloucestershire.—School, Dursley, for County E.C.; director of education, Gloucester.

Gravesend.—Schools, Westcourt and Northcourt estates (£27,000), for Borough E.C.; J. G. Bennett, borough architect. School (320 places), for Church of England managers; secretary.

Halesowen.—Houses (66), Hill Bank Farm; borough surveyor, Council House.

Halifax.—Savoy cinema and café; G. Coles, architect, 40, Craven Street, London, W.C.2.

Hanford.—Houses (80), Wilson Road; Stoke-on-Trent city engineer.

Hastings.—Houses (300), Ore; borough engineer.

Hereford.—Shops and flats, Whitecross Street; W. C. Bolt & Sons.

Heywood (LANCASHIRE).—Cinema, Church Street, for Heywood Picturedrome Co., Ltd.; secretary.

High Wycombe.—Factory, Castlefield, for A. J. Way & Co., Ltd., Stuart Road.

Horsham.—Public offices; Chapman, Lowry & Puttick, builders, Haslemere.

Hull.—Schools, Priory Avenue and Taylor Avenue; city architect.

Irlam (LANCASHIRE).—Cinema, Liverpool Road, for Honeywood Estates, Ltd.

Kent.—Nurses' home, &c., with engineering services, Minster-in-Thanet Institution, for C.C.; W. H. Robinson, county architect, Springfield, Maidstone.

Lancaster.—School, Skerton, for E.C.

Lanchester (CO. DURHAM).—Houses (58), Langley Park; J. Simpson, R.D.C. surveyor, Council Offices.

Llanelly.—Cinema for the Odeon Theatres, Ltd., Cornhill House, Bennetts Hill, Birmingham; H. W. Weedon, architect.

London.—(DEPTFORD).—Reconstruction of Tanners Hill area (£80,000); L.C.C. architect. (HAMMERSMITH).—Rebuilding, Hadyn Road works; Wallis Gilbert & Partners, 15, Elizabeth Street, S.W.1. (ST. MARYLEBONE).—Development of Princess Street area (£35,000): L.C.C. architect. (WEST HAM).—Public baths (£23,900); H. C. Horswill, Ltd., builders, 182, Green Street, E.7. (WOOLWICH).—Extensions to Polytechnic (£20,000); Governors.

Lostwithiel (CORNWALL).—Cinema, South Street; H. M. Williams, architect, Arthur House.

Manchester.—Further development of Wythenshawe housing estate (£157,538); city architect.

Margate.—Station, Westgate-on-Sea, for the Southern Railway Co., Ltd.; chief engineer, Cannon Street, London, E.C.4.

Meir (STAFFORDSHIRE).—Houses (62), for Stoke-on-Trent Corporation; G. & J. Seddon, Ltd.

Milnrow.—Houses, Haugh and Fir Grove; A. Travis, architect, Newmarket Street, Yorkshire Street, Rochdale.

Milton.—Houses (22), Bagnall Road; Leek R.D.C., surveyor.

Mirfield.—Cinema, Huddersfield Road; Fairhurst & Popplewton, architects.

Monmouth.—Houses (25); R.D.C. surveyor.

Morecambe.—Houses (42), West End Road; Fisher & Webster.

Mytholmroyd (YORKSHIRE).—Houses (24); U.D.C. surveyor.

Newmarket.—Houses (30); W. P. King, builder, Exning.

Oldbury.—Houses (34), Moat Street; A. G. Woodall. Houses (24), Foley Road; G. Hunter. Four shops and houses, near Bristnall Hall Road; Burke & Newstead.

Ollerton (NOTTINGHAMSHIRE).—Factory, for Butterley Co., Ltd., Butterley, Derby.

Orrell (LANCASHIRE).—Houses (22), for W. J. Bickerstaff & Sons.

Perivale (MIDDLESEX).—Factory, for the Philco Radio and Television Corporation of Great Britain, Ltd.

Pershore.—Houses (24); R.D.C. surveyor.

Port Glasgow.—Cinema (2,400 seats) for the Eclipse Picture House Co.; the manager.

Risca.—Houses (40); clerk, Council Offices.

Rochdale.—School, Greenbank, for E.C.

Rotherham.—Houses (592); borough surveyor. Extensions to Municipal offices (£22,100); Beeden, Ltd., builders.

Scarborough.—Premises, Westborough, for the Martins Bank, Ltd.; Kitson, Parish, Ledgard & Pyman, architects, Lloyds Bank Chambers, Vicar Lane, 1.

Sheffield.—Houses (24), High Storrs Crescent; M. J. Gleeson, Ltd. Cinema, Southey Green Road; T. F. Macdonald.

Sidcup.—Factory, Clubbs Farm, near Rubley Corner, Foots Cray, for Modern Paints & Finishes, Ltd., Kent House Road, Beckenham, Kent.

Slough.—Houses (36), Stoke Poges Lane, for Manor Park Construction Co., Ltd. Houses (148), Lewins Farm, for Salt Hill Construction, Ltd. Premises, for the Slough & District Co-operative Society, Ltd., Wexham Road.

Smethwick.—Factory and offices, Bearwood Road, for the British Pens, Ltd., Bearwood (£28,000), with electrical work; Whittall & Sons, Ltd., builders, Lancaster Street, Birmingham.

Stoke-on-Trent.—Houses (32), North Street; J. G. Holloway & Co.

Stroud (GLOUCESTERSHIRE).—Houses (34); F. A. Smith & Son, builders.

Thornton Heath.—Factory, Gloucester Road; Cripps Construction Co., Ltd., 116, Putney Bridge Road, London, S.W.15.

Tyseley (NEAR BIRMINGHAM).—Factory, Reddings Lane, Tyseley, for the Midland Manufacturing Co., Ltd., Barford Street, Birmingham (£30,000), with electrical work; Geo. Webb & Son, builders, Birmingham.

Waddon.—Two factories, Progress Way; Croydon Factory Estate, Ltd.

Walsall.—Factory, for Ansell, Jones & Co., Ltd., Birmingham, 19.

Watford.—Houses (24), Aldenham; R.D.C. surveyor, 25, King Street.

Wembley.—Factory, for Lacroix Fils (London), Ltd., 132, Great Portland Street, London, W.1.

Whitehaven.—Schools (£15,628), for Borough E.C.; E. Moorhouse & Sons, builders.

Whitley Bay.—Houses (21), Claremont Road; Dixon & Bell, architects, Pearl Buildings, Northumberland Street, Newcastle-on-Tyne. Houses, shops and flats, Beresford Road, for C. W. M. Potts, architect, 4, The Elms, Sunderland.

Winchester.—Nurses' home, Royal Hampshire County Hospital (£20,000), electrical work; Cancellor & Sawyer, architects.

Workington.—Cinema adjoining the General Post Office for Graves Cinemas, Ltd. (£35,000).

Worthing.—School (300 places), for Borough E.C.; director of education.

York.—Institute of Agriculture, Askham Bryan (£83,461), electrical work, for the Yorkshire Council of Agricultural Education; Sir P. Jackson, chairman.

Yorkshire.—Schools (480 places), Mirfield, for West Riding E.C.; education architect, Wakefield.

The I.E.E. in Birmingham

THERE were about 350 present at the annual dinner of the South Midland Centre of the Institution of Electrical Engineers which was held at Birmingham on November 27th. The chairman (Mr. E. A. Reynolds) proposing "The City of Birmingham," said that almost everything electrical was made there, the chief exception being cables, although the first submarine cable was manufactured at Hay Mills. In responding the Lord Mayor (Ald. H. Roberts) stated that the electricity sold in this country was now two-thirds of that sold in Germany, whereas two years ago it had been only half. "The Institution" was proposed by Ald. J. Chuter Ede, M.P. (chairman, London J.E.A.), who urged that the uncertainty regarding the outcome of the McGowan Report was not good for the electrical industry. Whatever the result might be, however, he believed those concerned would work loyally to make it a success. Response was made by Mr. H. T. Young (Pres., I.E.E.), who referred to the Centre as the largest of the Institution with its 1,580 members from nine counties, and commended the decision of the City Council to light 150 miles of streets by 4,000 lamps. He suggested that manufacturers should call in the aid of designers in fitting electrical apparatus to the homes of the people. Mr. H. Hooper (senior vice-chairman) proposed the toast of "Kindred Societies and Guests," for whom Mr. F. Forrest (Pres., I.M.E.A.) replied. The health of the chairman was submitted by Mr. F. Burton.